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NOTES
ON
THE NICARAGUA CANAL

SCENE IN NICARAGUA.

NOTES

ON THE

NICARAGUA CANAL

BY

HENRY I. SHELDON

SECOND EDITION

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1899

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PREFACE.

The visit to Nicaragua described in this volume was undertaken in search of some means for stimulating the tardy development and depressed agricultural interests of California, Oregon, and Washington. It resulted in an opinion in favor of constructing a ship-canal at Nicaragua. The subject has proved of such increasing interest, and facts regarding it have so accumulated, that the only satisfactory way to place before others the information gathered is to print it.

The visit and the subsequent investigations have made part of the work of a busy life. The subject is so large, and the data collected are so fragmentary, that the writer, knowing nothing of book-making, and having only a plain statement to make, has called these memoranda — for they are only memoranda — "Notes on the Nicaragua Canal." The visit was made in the spring of 1895, and the succeeding interval has been considered a suitable time for deliberation before forming any final judgment on matters of such importance.

The attitude of the country toward the proposal to give national aid in constructing the canal is nearly as follows: The Pacific Coast states and the Southern states are heartily in favor of granting such aid, the plans for construction and the terms on which the aid is to be granted to be, however, first carefully considered. The states of the mountain region, Colorado, Montana, Wyoming, Idaho, and Utah, are also inclined to favor national aid. In the Eastern states there are many men of broad views who are alive to our development as a nation, in whose minds are many thoughts on that subject, and who favor early construction by the United States; but in those states are found also the chief holders of the securities of the trans-continental railroads, who regard increased transportation facilities for the Pacific Coast states, by water especially, as detrimental to the companies in which they are interested. Accordingly, most of the opposition to national aid comes from the Eastern states. The Central states may be described as being in a deliberative attitude. They want that to be done which is best, all things considered, for our development as a nation. Especially they wish for more information as to the practicability of a canal, its cost, and its probable effects on our commerce and growth. The center of the population, resources, and political power of the country is now in the Mississippi Valley. The Central states will have the deciding vote on granting national aid.

In all my measurements of elevations I used an aneroid surveying-barometer, which proved a very satisfactory instrument. It is always desirable, when going over the line of any proposed work, to be able to take some of the chief altitudes. The canal location in Nicaragua has been repeatedly surveyed since 1850, and with much thoroughness, and for several years before visiting the country, I had been examining the profiles of the crossing, and also other maps and drawings published by the United States government, but I had found no measurements of some neighboring positions, knowledge of which was desirable. It is scarcely necessary to add that such measurements as my own are not expected to be the basis of any actual work, being always only preliminary.

Special attention is invited to the necessity with which we are now confronted, for the first time in our national existence, of seeking markets in foreign countries for our manufactures and products, in order to find employment for our working-men, and to the very important opportunities for securing such markets in the countries bordering on the Pacific Ocean, which the construction of a ship-canal in Nicaragua is likely to afford. When we have built up such a foreign trade as our position and resources justly entitle us to have, such commercial depressions as that which has existed since 1893 will be impossible, for even if business activity falls off in the United States, there will still be markets for our productions in some other countries.

I shall be glad to receive any suggestions based on experience, as to the best ways to promote the health and efficiency of employees engaged in out-of-door work in warm climates.

One person among a population of seventy millions can do very little in a national undertaking, but my wish is to contribute something by this book, even if only a little, to an enterprise of very great importance to the country.

363 Erie Street, Chicago.
February 22, 1897.

PREFACE TO SECOND EDITION.

The subject of the Nicaragua Canal has recently assumed an entirely new aspect. The annexation of Hawaii and the prospect of United States ownership and government of the distant Philippine Islands, in whole or in part, have created immediate need of a shorter route between the Atlantic and the Pacific than the long voyage around Cape Horn.

Since the first edition of these notes was published, the writer has visited the Suez Canal and the Corinth Canal, collecting data such as seemed likely to be of service in Nicaragua; he has also visited Jamaica, where a railway and an extended system of highways and bridges have been recently constructed, and are successfully maintained in climatic conditions so similar to those which prevail in Nicaragua as to make them of great interest and especially instructive. The labor to be employed in construction in Nicaragua, and which can be secured in Jamaica, its efficiency, cost, and the best methods for its management, together with the new Jamaican laws regulating its employment in other countries, were also examined. The data collected are printed as Addenda near the close of this volume.

PREFACE TO SECOND EDITION.

Acknowledgments of assistance kindly given are made to Captain A. S. Crowninshield, United States Navy, Chief of the Bureau of Navigation, Washington; Monsieur R. R. de Rouville, Paris, Director of the Suez Canal Company, and Henry Sherman Boutell, Esq., Member of Congress from the Sixth District of Illinois.

H. I. S.

363 Erie Street, CHICAGO.
October 24, 1898.

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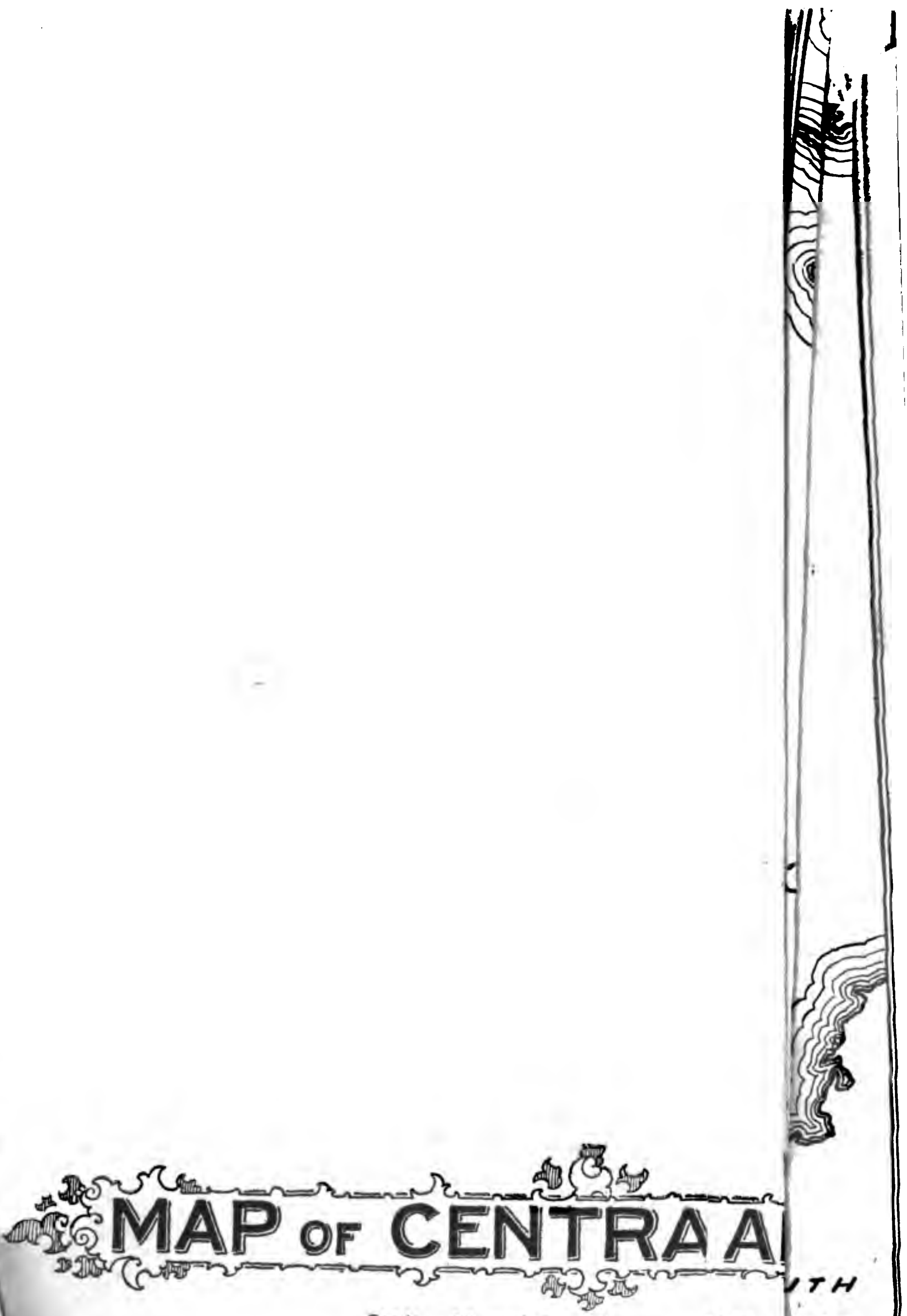


MAP OF CENTRA A

NOTES
ON
THE NICARAGUA CANAL.

CHAPTER I.

THE JOURNEY TO NICARAGUA.

After half a century of occupation by the United States, California has a population only about as large as that of the city of Philadelphia. The census of 1890 assigns 1,046;252 population to Philadelphia and 1,208,130 to California. Yet the state is one thousand miles long, with a soil of unrivaled fertility and the most attractive climate in the United States. Oregon, settled by our people even longer than California, has a population of only 313,767, and the state of Washington only 349,390. For many years I have occasionally visited the Pacific Coast, for either business or pleasure, and always the most striking aspect of its condition has been the absence of satisfactory markets for its products. Not a bushel of its large wheat crop comes to the Atlantic coast by rail, as wheat cannot bear the cost of so long carriage.

Neither can its lumber or ores come by rail. In many places, after the farmer or the fruit-grower has paid the charges of the transportation companies, there is little or nothing left for him. The population continues small because the markets are so inadequate. Twenty-five years' trial has demonstrated that if railroads are to be the sole means of communication, the development of the Pacific states will be very slow.

The only promise of relief is in securing for these states some shorter transportation to the Atlantic states, and also to Europe, by water. Now, everything carried by water must pass around Cape Horn. The only shorter route apparently practicable is by way of a ship-canal across the isthmus, through Nicaragua. This will save ten thousand miles of the distance around Cape Horn, and will enable an ordinary steamer to go from San Francisco to New York in fourteen days. The exact distance, by such canal, will be 4,760 miles. The ordinary railroad freight service consumes from 17 to 21 days. The canal line will be only about sixty per cent longer than the rail line. Our country is so widely extended, three thousand miles from east to west, that cheap and speedy water transportation like this is almost absolutely needed to bind and hold it more closely together. At present, in time of war, such parts of our growing navy as might be on either the Atlantic or the Pacific side would be for a considerable time of no use on the other ocean.

Naturally, many persons are now thinking seriously about the Nicaragua Canal. A certain amount of information is accessible, but it did not lead me to form any decided opinion, either in favor of or against the project. I wished to see the country, its lakes, rivers, and forests, and I visited Nicaragua expressly to examine the proposed route of the canal. On returning, the subject appeared so large that it seemed best, to assure a careful estimate, first to examine some of the ship-canals in other countries, and also to learn the opinions of some of the leading European engineers. With this in view I visited the Manchester and North Sea-Baltic canals, and also conferred with their chief engineers, and the chief engineer of the Suez Canal, as to the situation in Nicaragua.

It may be well to say at the outset that I reached the conclusion that the canal in Nicaragua is practicable, and can be constructed at a cost on which fair returns can be earned. It also seems clear that, for many reasons, it is not a suitable work for private capital to undertake, and that it will be better that our government should assist the undertaking.

There are strong equities on the side of national aid, inasmuch as the chief benefits will never be the tolls collected from passing vessels. The canal may so develop our trade with eastern Asia that a single year of that trade will exceed in volume the total cost of its construction. Its opening will double in value almost every acre of agricultural land in California, Oregon, and Washington, and the population of those states will be more than doubled. Congress rarely moves in advance of what our people demand; and Nicaragua is so far away, its conformation, climate, and races have been so little described, that our people have not as yet generally acquired sufficient detailed information about the country, and how the canal is to cross it, to form any widespread opinion. As the journey is out of the line of pleasure-travel, and is attended with some hardship, so that comparatively few persons wish to make it, I have ventured on preparing some notes of what I saw and learned, in order that others who so wish may learn a little more about the projected canal. An agreement in opinion among the members of any special profession carries great weight as to any subject of which they approve, and a most noticeable thing about the Nicaragua Canal is the favor with which the profession of civil engineers at home, in

Great Britain, and on the Continent look upon the project. They seem to be almost unanimous that the canal is practicable, and that its early construction is desirable.

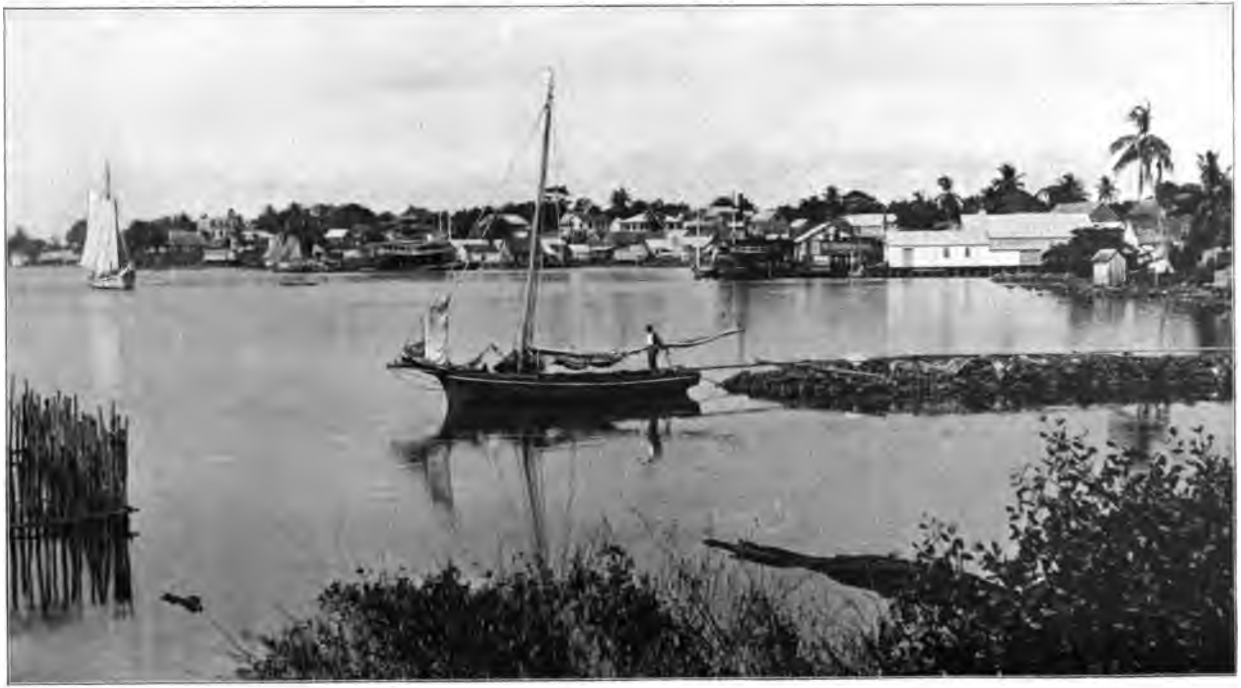
Our government has sent several commissions to examine the country, and it is somehow generally supposed that the commission sent there in 1895 reported adversely. This is not correct. The commissioners are in favor of the canal. They wish the present plans modified in several particulars, and a larger canal constructed than has as yet been proposed, so as to accommodate our largest battle-ships, holding that if the United States government is to undertake its construction the cost is a secondary matter. The chairman of the commission, a distinguished officer of the army, and one of its corps of engineers, was asked to give his views more at length by a committee of Congress in May, 1896, and he then stated: "My predilection is entirely favorable to the project. I would like to see the American engineers have a chance to show what they can do toward building a ship-canal. The Frenchmen (at Suez) and the Englishmen (at Manchester) and the Germans (at Kiel) have all had a chance, and now I would like to see what the American engineers can do." As to the report of the commission, it will be taken up in detail farther on.

In March, 1895, I set out for Nicaragua, approaching the place of crossing from the Atlantic side at Greytown. I should state, by way of explanation, that I accepted no passes anywhere by rail or steamer, and incurred no obligations which would prevent taking an unbiased view. I should add, also, that I have no interest, pecuniary or by friendship, in the present company which has been trying to construct the canal, and did not carry even a letter to its officers in Nicaragua. The Secretary of State in Washington, General Gresham, whose death is so much deplored, gave me a general letter to our diplomatic representatives in Central America. Gen. John W. Noble, who was very friendly to the canal when Secretary of the Interior in the Cabinet of President Harrison, obtained for me a letter to a member of the Cabinet at Managua from Dr. Guzman, the minister who has so long and so efficiently represented the republic of Nicaragua in this country, and a friend gave me a letter to the American minister to Nicaragua and Costa Rica, the United States maintaining but one representative for both these countries. Books of travel often do not give distances, and rarely mention current expenses, though the details of the latter frequently afford quite a graphic view of life in the country traversed. These I have endeavored to note, and also to state where articles recommended can be obtained. All Nicaragua prices mentioned are in silver. The illustrations are from photographs taken by Mr. William V. Alvord and Mr. George C. Bennett, and also by Señor Aguirre of Managua.

The Nicaragua Canal route is about 240 miles north and west of the attempted De Lesseps canal at Panama. The distance across the country of Nicaragua, from ocean to ocean, is about 170 miles. The route was chosen for two reasons — one, because the mountain range which runs unbroken from the northern to the southern continent is here depressed to only 153 feet above the sea, the lowest crossing between the Arctic Ocean and Cape Horn. Another reason is, that between the two oceans, high up, 110 feet above the sea, is a large lake, the largest body of fresh water between Lake Michigan and South America. It is about 92 miles long and 34 miles wide, and furnishes a flow of about ten times enough water to fill canal-locks the year round. Out of this lake runs a stream, the San Juan River, flowing some ninety-five miles through mountains and forests to the Atlantic. The present canal company say that at high water, in the rainy season, a steamer of six hundred tons can sail from the Atlantic up this river and across the lake to within seventeen miles of the Pacific. The low notch of 153 feet is in that 17 miles from the lake to the Pacific. The project of a crossing for ships from ocean to ocean at this place is three hundred years old. General Grant, sagacious and far-sighted, saw its practical value, and, after his retirement from the Presidency, advocated a canal there with the utmost earnestness.

It is not generally known that Commodore Vanderbilt, the founder of the fortune and house of Vanderbilt, after personally inspecting the river San Juan and the lake of Nicaragua, came to the conclusion that a canal should be built there at once. His agents applied to the Nicaragua government for a concession, and it was granted to him and his associates in 1849. It is an illustration of how good, careful work tells, that the engineer he employed to make the necessary surveys, Col. O. W. Childs, who went over the entire country carefully, and prepared all the plans for a canal along this route, did his work so efficiently that to this day other engineers speak approvingly of it, and in many cases refer to his altitudes as authoritative. The name of Commodore Vanderbilt's corporation was the Atlantic and Pacific Ship-Canal Company. But he was too early in the field. He could not obtain the requisite capital abroad, and our country was not then equal to so large an expenditure. His concession lapsed. The old Commodore, however, did not wait for canal-building. The gold fever was then carrying multitudes to California, and when he visited Nicaragua he placed steamers on the San Juan River and the lake, and stage-coaches to cross the seventeen miles from Virgin on the lake to San Juan del Sur on the Pacific. He called his crossing the Nicaragua Transit Route. It was opened in 1852, and successfully maintained until 1857, and on a large scale. Many thousand Americans have crossed by his line. Later, the opening of the Panama Railroad made the Transit Route unnecessary.

In March, 1887, Nicaragua, and in July, 1887, Costa Rica, whose northern boundary is in part along the San Juan River, granted concessions to build a canal, and February 20, 1889, a company was organized in New York for this purpose. It took power to issue one hundred millions of bonds, and one hundred millions of stock. It has expended at this date (1897), it is said, about four and a half million dollars. This has been largely for surveys, piers, clearing of way, telegraph and railroad work, headquarters, and hospital buildings — all necessary, but mainly preliminary. It has also excavated a beginning of the canal on the Atlantic side. This company has the drawback of a construction company, an organization within the parent company, formed solely to do the actual work of building the canal, and to take as payment the bonds and all or part of the stock, and organized under a charter obtained from the state of Colorado. Enough bonds were to be sold to pay the cost of building the canal, and all purchasers of the bonds were to receive, also, an equal amount of the stock. This method of raising money is common enough with us, but to start a business in debt for the entire cost of the plant is not a substantial way, and is not followed in any other country. It belongs to the early days of American finance, and in time we shall graduate out of it and come to some such basis as that of English railroad - building, where the bondholders usually contribute one third of the cost and the shareholders the remaining two thirds, the bonds having then a staple value, and foreclosures being practically unknown. The excuse usually given for the large bond-issues is, that it is the easiest way of raising money. The plan has, however, some serious disadvantages as well. It limits greatly the classes of investors who will take the securities. It does not suit small investors at all, and it



VIEWS OF BLUEFIELDS.

excludes altogether a now rapidly increasing class in the United States,—those who would take the bonds of the company to a reasonable proportion of the cost of the undertaking, the ordinary stockholders to furnish the remainder. The construction company was placed in the hands of a receiver by the courts soon after the panic of May, 1893, and all work in Nicaragua has been suspended.

As Greytown is just now rather an inaccessible place, I sailed from New Orleans for Bluefields, Nicaragua, which is sixty miles north of Greytown, by a steamer of the Wilson Line. Our leading business with Nicaragua is the importation of bananas, Bluefields having now become the second largest place of exportation on the continent. The firm of John Wilson & Co. of New Orleans is engaged in this business, and while their steamers are built expressly to carry fruit, yet they have also good accommodation for passengers. Their managing partner, Mr. Dell Orto, took me over one of their fine steamers, the John Wilson, lying at the Illinois Central Railroad Company's wharf, and discharging bananas directly into the company's fruit-cars. A large, commodious building extends over the cars to the river's edge, and the unloading and loading goes on under cover all the year round. When a steamer is about to arrive, telegrams are sent out to distant correspondents, and the next day, as the ship comes up to the wharf, dispatches are received from St. Paul, Sioux City, Denver, Kansas City, and points as far east as Ohio, ordering the bunches required. A large force of men begin unloading, almost running with the bananas, instead of walking, and in six to eight hours the whole cargo is in the cars and on the way to its destination.

I was expecting to sail under the American flag, but as we dropped out into the stream the Norwegian flag was run up, and a Norwegian captain on the bridge watched the work of a Norwegian crew. Our merchant marine, once so large, has practically disappeared from the seas. Of the 3,434 ships which passed through the Suez Canal in 1895, only five carried the American flag. Our exports are large, and our imports also, and every year we pay out great sums to foreign nations to carry our commerce in their ships,—$143,000,000, as one of our ex-commissioners of navigation has estimated. We pay it, too, in gold, and just when our country is being drained of the gold we need for our own national treasury. When the Civil War broke out we had our share of the carrying trade of the world, perhaps one half, and our ships were found in all chief ports, but the Alabama and her consorts, built in England, drove our commerce from the seas. The fifteen million dollars paid us by England, under arbitration, for those losses has been a very meager compensation. It was at this time, too, that wooden ships gave place to iron and steel, and we have never been able to build cheaply of the latter. It is estimated that only four thousand men are engaged in ship-building in the United States, but to help this little band our laws forbid an American citizen to buy a ship abroad and sail it under the American flag. Even payment of a heavy duty would not answer. He cannot bring such a ship here on any terms. We need greatly to build up again our merchant marine. To do this we need liberty to buy ships in any country where they are cheapest, bring them home, and register them as American ships. If the political forces in Washington will not concede this, then we should have some other aid from the government in favor of our shipping. Our people do not seem to like the plan of subsidies as followed by other nations. There remains to us one course which would be extremely efficient, namely, a small reduction in the tariff duty on all cargoes brought to this country in American ships.

As this New Orleans house did not possess their own ships, they asked a ship-builder in

Bergen, Norway, to build for them steamers specially for their trade, furnish the captains and crews, navigate them, and handle all cargoes for an annual sum. Seventeen men make up the officers and crew of the John Wilson, shipping for two years' service. Every two years the steamer returns to Norway for a holiday and repairs. Her discipline was admirable. Every man on board had an interest in the net earnings, and from New Orleans to Nicaragua I did not hear a single order given. Every one knew his duty, and no commands seemed needed.

Our pilot, Mr. Church, asked me to come upon the bridge and have a look through his glass at Captain Eads's successful jetties at the mouth of the Mississippi, a good monument to an adventurous and skillful engineer, but, owing to the lateness of the hour, I declined. After completing these jetties, Captain Eads gave all his energies to a crossing for ships by transport on a specially constructed railroad at Tehuantepec, in lower Mexico, but died in the midst of this work.

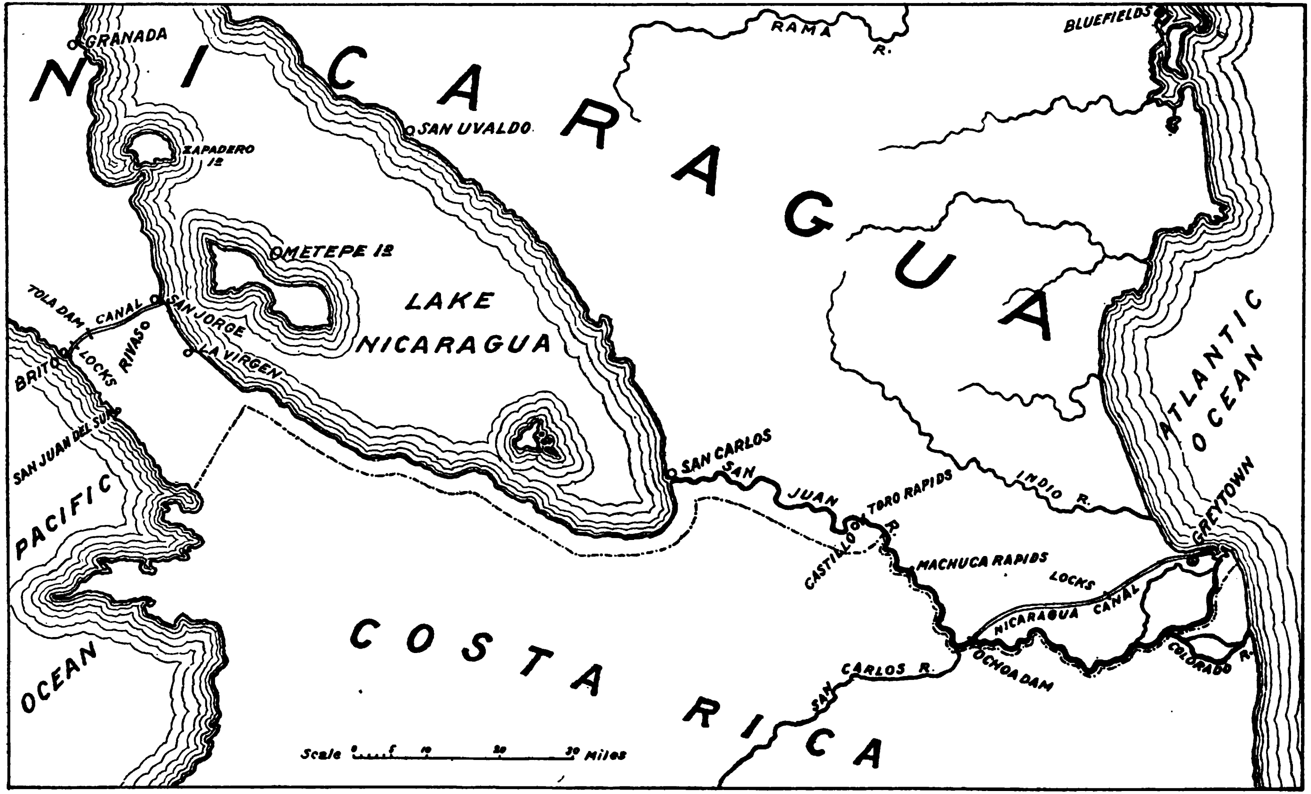
The next morning we were well out on the Gulf of Mexico. The second day overcoats were discarded, and the third day our passengers donned their summer clothing. We sailed across the Gulf of Mexico, past the western end of Cuba, though not in sight of the coast, then down the Caribbean Sea, keeping well clear of the coast of Mexico, as lighthouses, bells, and buoys are rare in that part of the world. The passage was most agreeable. Being fond of sea-life, I was about the ship by night as well as by day. As it grew warmer, nothing but a cap and slippers, besides one's sleeping suit, was needed for rising and going on deck, and as we approached the tropics the nights became charming. New stars came into sight, the north star sank lower, and soon the Southern Cross shone brilliantly beyond our bow, and all the southern sky was filled with unfamiliar constellations.

After four days' steaming we arrived at Nicaragua, stopping at the port of Bluefields. The steamer discharged her cargo, left her passengers and proceeded up the Rama River sixty-five miles, collecting bananas at the various plantations on her return trip. Almost all the plantations are long and narrow, having a small frontage on the river. They are owned chiefly by Americans. The father of the business is Capt. B. B. Seat of Texas, who began the cultivation and export sale there only twelve years ago. Now, Bluefields exports two million bunches annually.

Though Greytown, the starting-point of the canal, was so near, yet the forest on that coast is so dense as to be impassable, and in the absence of roads the only means of travel is by sea. There is not even a telegraph line out of Bluefields. There were small sailing-vessels going to Greytown in abundance, but I waited four days for a steamer, spending the mornings pleasantly in the market, which was full of curious and novel fish of brilliant hues, and of tropical fruits, plantains, cocoanuts, pineapples, mangoes, and many unknown varieties; or at the International Club; or discussing American business interests at the office of Captain Seat, who is our consular agent. He took me to call on General Cabezas, who commanded the department of Zelaya, tall, suave, dignified, and extremely courteous, a young general, and hopeful of making a good name for himself in the history of his country. At last a small coasting-steamer came in, bound for Greytown, and belonging to a Boston firm who are the chief cutters and shippers of mahogany on that coast. We started about dusk, and the next morning were off Greytown; but the old bar has formed again and we could not cross it. After long whistling for the local Greytown tug, we saw it steaming up the coast from the south, but it made for the harbor without coming our way. With our glasses we watched it slowly work through the shallow water on the bar, bumping on the bottom several times, grinding in the sand, but finally taken along by the waves, and going up the river. By afternoon a large rowboat came out, manned by Caribs. The captain, portly and commanding, sat high in the stern, wearing a large Panama hat. The Caribs are the best sailors on all the Central American coast. Our crew of four men all sat at the bow, and paddled instead of rowing. The Adirondack, the Lake Superior, and the Indian paddling are all good, but none are quite equal to the Carib style, especially in taking the paddle out of the water at the finish of the stroke. The captain's instinct was wonderful. Sometimes he kept well ahead of the combing breakers, and sometimes rode swiftly on the top of a big wave, but never on it at the moment it broke into white foam, as our boat would then have instantly filled. I watched each breaker as well as I could and then watched the captain, but could not learn his method. As a big roller came combing up a hundred feet behind us, white and foaming, our crew would turn anxiously to watch its progress with relation to the boat's, but at his fiery order in Carib, possibly equivalent to "eyes front," they would turn their backs to the waves, paddling vigorously, and plainly with great trust in his sagacity. Once he called on his men for a spurt as a big white roller came swiftly up behind us. Alive to the danger, they made the heavy boat fairly dart. How it was done I cannot see yet, but we came through with not more than a quart of water in the boat, and not one large wave breaking close to us. When the old captain called at my hotel the next day to collect his fare, I praised his skill, and he said he had been years on the bar and had never capsized with a passenger.

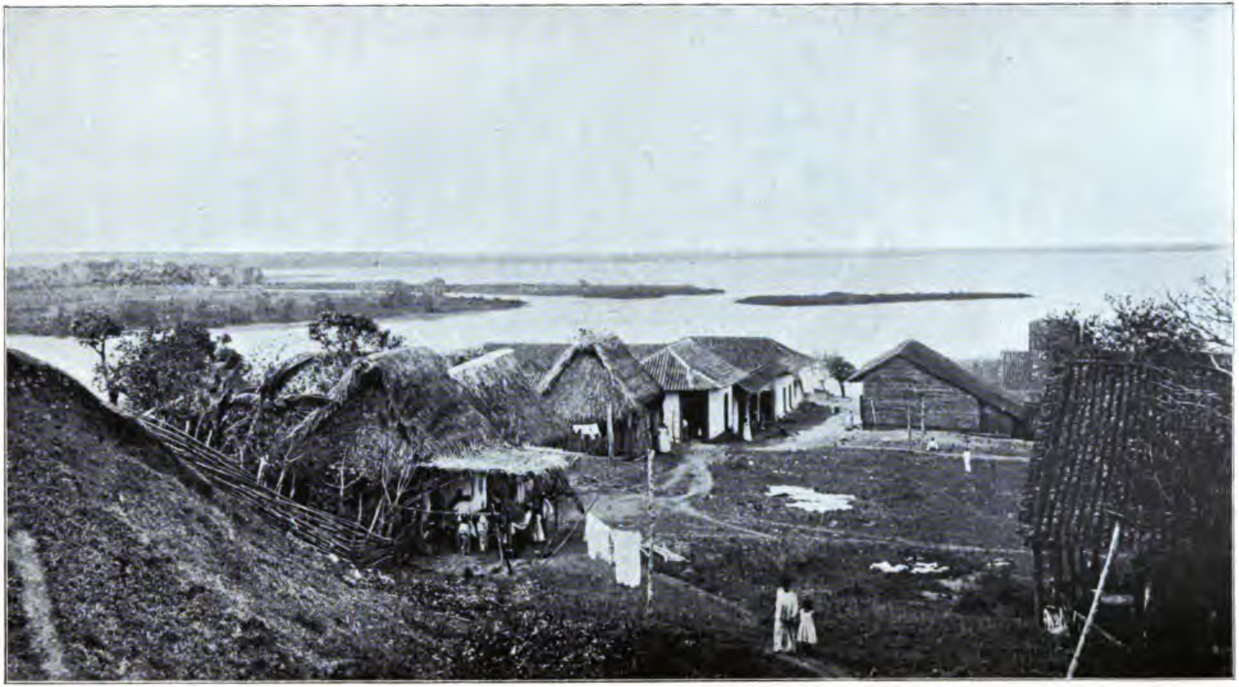
I remained four days at Greytown. Our very efficient consul, Mr. Thomas O'Hara of Michigan, showed me every attention; and I called on Mr. S. C. Braida, our ex-consul, who, after a varied life in our cavalry service during the war, and then in scientific studies, had been engaged with the canal company, and after leaving their employment remained in the town. He joined me in my rides and explained the harbor. Greytown is on the river, back from the sea more than a mile, surrounded by swamps, and might be expected to be a hot-bed of fever. In fact it is not, the location being flat, low indeed, but swept by the winds. Strong breezes, and no valleys, give health. Palms grow in the squares, and all around is the tropical forest, too dense to penetrate. The place has a quiet air now.

As at present projected, the canal is to have its Pacific entrance at a good site for a harbor on that coast, called Brito, then cross the low



MAP OF PROPOSED LINE OF NICARAGUA CANAL.

ridge in the great continental divide above spoken of, this section then ending in Lake Nicaragua. The bed of the lake there has to be excavated and a channel cut through submerged rock out to deep water. Vessels are then to sail across the lake 56½ miles to its outlet at San Carlos. Then they are to go down the San Juan River 64½ miles to Ochoa. Comparatively a small amount of dredging to deepen this river will be required. Two low hills have been found on opposite sides of the river, near Ochoa, and it is proposed to build at this natural site a dam, twelve hundred feet long and seventy feet high. The dam will make the river for 64½ miles down to this point level with the lake. Vessels entering the lake from the Pacific can sail 56½ miles across the lake, and 64½ miles farther along the San Juan, to Ochoa, — in all, 121 miles on the same level, and without passing any locks. On the Pacific side of the lake it is 14½ miles from the lake to the first lock. From Ochoa it is 15½ miles to the first lock on the Atlantic side, so that the summit-level of the canal will be about 151 miles. There are to be only six locks, three on the Pacific and three on the Atlantic side. Below Ochoa the San Juan River is shallow, with shifting sand-bars all the way to the Atlantic. The last ten miles of its course is through low, level land, and it finds its way to the sea through several mouths. Of late years most of the water turns south at a point about twenty miles from the sea, and flows into the Atlantic through a channel called the Colorado, emptying into the ocean about fifteen miles below Greytown. This made a problem which has annoyed all the engineers, but a second important suggestion was made a few years ago, to abandon the San Juan altogether at Ochoa, to strike out through the country north of the river almost in a straight line to the Atlantic, cutting a wholly independent channel for the canal. It is thirty-two miles from Ochoa to the Atlantic along this almost straight line. Some small curves are to be made, and the canal is to re-enter the San Juan at Greytown, only a few hundred yards from where the river empties into the sea. The chief obstacle to this independent channel from Ochoa to the Atlantic is a range of hills, requiring a cut eighty feet wide, averaging one hundred and forty-one feet deep, and nearly three miles long. This cut is to be through rock. From the Ochoa dam the channel keeps the same level as the river and the lake for 15½ miles, then the canal descends through three locks, falling 45 feet in the first, 31 feet in the next, and 30 feet in the last lock to the level of the



SAN CARLOS. FOOT OF LAKE NICARAGUA.

Atlantic. At this last lock the canal is at sea-level, and the distance to Greytown is 9¼ miles. The hydrographic officers in Washington write me that the mean rise and fall of the tide at Greytown is only nine inches. They state that they have no data for Brito, but at Corinto, a short distance north of Brito, the mean rise and fall is 8.6 feet.

To summarize,—the canal route is to be 168 miles long from Brito on the Pacific to Greytown on the Atlantic. The first half-mile from Brito is at sea-level. Then in two miles the canal rises 110 feet, through three locks, to the summit-level, 151 miles long, then in 4½ miles it descends, through three locks, to sea-level again, and then continues at sea-level 9¼ miles to Greytown.

The estimated time required for an ordinary steamer to cross from one ocean to the other is twenty-eight hours. Electric lighting is to make passage by night quite feasible. The allowance for passing through locks is forty-five minutes for each lock. Only 26 miles of the 168 miles of canal is to be through excavations. Some 21 miles is through basins, and 121 miles through the lake and the river.

As nothing gives a picture of a foreign country like a description of any social affair, I wish to describe a small breakfast most kindly given me in Greytown. The hour was twelve o'clock, agreeably to the custom in Nicaragua of serving nothing but chocolate or coffee and rolls for the early hours of the day. We were four at table, all men, and our host was dressed in white. The first course was a clear soup, with some novel kind of macaroni in it, cut up very fine. A grated cheese was served, to be added to the soup to each one's taste. Claret was brought on after the soup, a capital vintage which had been four years in glass at Greytown. The place is a free port, and there being no duty on imported articles, some very satisfactory wines are to be had there. The next course was a chicken fricassee, with boiled rice served as a vegetable. The flavoring of this fricassee was novel and extremely good. We had next some spare-ribs, the pigs having been fed on cocoanuts. This dish appeared to have been first roasted and then carefully completed as an entrée. It tasted very like some kind of game. As a novelty for myself, as was explained, the next course was roasted peccary, the wild peccary which every boy-reader of Captain Mayne Reid's stories remembers. I must say that, cooked as they serve it in Greytown, it is a capital dish. We had next a fresh pineapple cut in slices, and brought on in a glass dish. Not a particle of sugar had been placed on this delicious, juicy fruit, yet it tasted of sugar. It was what they call the sweet pine, so unlike the pineapple of our northern markets as to deserve another name. This pine is soft as a ripe peach, and when it is cut, the juice runs out like water. We had, last, a custard or sago pudding, and finished with chocolate, and some cigars from Jamaica. These were unlike the Cuban growth, of different flavor, and very good.

The standard dishes of this country are beef and chicken. Eggs in some form, and rice, are also usual. The late hour for breakfast, half-past ten, or even twelve o'clock, people from the United States do not like at first. It is better, however, to learn to conform to the custom. Opinion is divided as to whether in managing large bodies of men in construction-camps it is better to follow the American customs as to the breakfast-hour, some companies following the Spanish-American plan and some the American. I do not know what plan the canal company adopted. Native labor, of course, should be allowed to continue its usual custom, but my own view is, that all men brought down from northern countries, especially in districts where there is any possibility of fever, should be given their usual substantial breakfast before beginning the day's work.

The climate of Greytown is very moderate for the tropics. One day I rode along the coast about seven miles above the town as far as the outlet of the Rio Indio. The grass came close down to the beach, unlike our own coasts, and in the forest, which grew from one hundred to three hundred yards back from the beach, were waving palms; but few other things spoke of tropical life. A succession of small farms held their own all the way, the farm-houses facing the sea. The temperature at Greytown I found almost uniform, the night about the same as the day, from 70° to 75°. No one wore an overcoat at night, and on inquiring I was told that probably there was not an overcoat in the town. There was no fierce heat at mid-day, though persons who had the choice of sun or shade walked in the shade. Neither was there any coolness at night. Ordinary houses at Nicaragua have no sashes nor glass. There are solid wooden shutters, which are thrown open or closed, as desired.

CHAPTER II.

THE ROUTE OF THE CANAL.

Greytown was very quiet. There was an absolute cessation of all the company's work on the canal. The large dredges, purchased at Panama, were moored in the river, partially protected by wooden casings. The substantial buildings of the company were unoccupied and closed, but all neatly painted, in apparently good order, and guarded by careful watchmen. I examined the interior of a number of these buildings and found them tidy, all the unused supplies piled away systematically, and everything apparently ready for occupation and resumption of work on short notice. There was everywhere an air of watchfulness and system.

It is not easy to speak accurately of the work the canal company has already done. The expenditure on preliminary surveys was unusually large. I spent part of a forenoon in the engineer's headquarters, going over the detailed surveys. I was amazed at their thoroughness and completeness. A safe statement would be that no railroad west of the

Mississippi has ever been constructed at such enormous expenditure for exhaustive measurements, borings into the soil and rocks, and running of lines. At one side of a large drawing-room were field-notes, case after case of those small books which engineers know so well, carried by careful men through heat and rain, and hunger, and deep water, and endless hardship. I was pleased with the air of care and good management about the company's property, and also with what I learned of the prudence and economy they had exhibited all the way through when engaged in construction. One of the subordinate medical officers complained to me strongly of their administration being too economical, and instanced his being once sharply checked because too many eggs were used in his ward of the hospital. Another employee, who used a steam-launch, recalled their refusal to allow it to be repainted. It was refreshing, from the standpoint of an employer, to observe these instances of strict oversight of expenditures, recalling, too, that the headquarters of the company were so many miles away from the scene of work.

The company has built a standard-gauge railroad from Greytown nine miles through the swamp forest to the first high land, following closely the canal. I rode out about a mile beside the track to examine its condition. The rails were in good order, and but little rusted. The tropical rains of Nicaragua are so heavy that the condition of the embankment became a most important matter. The line had not been used, nor in any way attended to for nearly two years. The condition of the embankment used as a road-bed, varying in height from two to four feet, was as follows: Grass had grown on the road-bed somewhat, and a considerable amount on the sides of the embankment. A few small bushes had also grown up. A trail for horses and cattle at pasture wound along the foot of the embankment. I could find no signs of wash or erosion by water at any place examined. It was just such an embankment as one would find in any northern state, belonging to any small railroad,—compact, well settled, green, and requiring no special trimming up. I searched along it in vain for any indication that the rainfall of that region was heavy. The question of washing-in of canal banks and cuttings deserves serious consideration, and as bearing on it I state the condition of this unused embankment. As to the ties, the less said the better. They were badly decayed, and some almost in brown powder. I am told that they were creosoted ties shipped from the United States. Ties can be had in the tropics which average on tropical railroads about twelve years' service. It would be well to look into this when fresh construction is ordered.

Farther on, I was told, bushes and trees had so grown up as to make the railroad impassable on horseback. This portion I did not examine, and cannot speak of. In a land of perpetual summer and warm rains this could well be expected.

The canal was there, starting from the San Juan River, near the sea, and stretching cool and clear out toward the distant hills. There were no facilities for going up it, and I did not make the attempt. I crossed it several times, on a flatboat, with my horse, and it looked like any other canal, only wider. There were no signs of washing of banks or filling up. I made no measurements of depth, however.

Much has been said about the harbor of Greytown. In 1860 it was good, and steamers could go easily up the river to the Greytown wharves. The San Juan then broke its banks about twenty miles above its mouth, and changed its chief current into the Colorado, and, there being no washout by the San Juan current, the sea rolled the sand up across its mouth until a high bank was made that one could walk on. Greytown was no longer on a river, but on a lake, and lost its importance and its commerce. This continued until 1890.

The canal company then built a breakwater of piling, with some rock, out into the sea, on the east or lower side of the river. Some dredging was also done, and a good channel was obtained again, so that vessels drawing twelve feet came across the bar and up the river to Greytown. All engineers know that no such timber-construction will stand heavy storms from the open sea unless earth backing is placed against it, or substantial rock filling within. Newly made shore formed against a portion of this breakwater, and that part remains, but the portion extending seaward beyond this newly made shore has almost disappeared. The channel has filled up, the bar has formed again, and going out of Greytown one day in a tug drawing four and a half feet of water, we bumped often on the bar, and stopped several times aground, until higher waves raised us so that our propeller could crowd the boat forward. With that small draught we were a considerabe time, say twenty minutes, in getting over. A small breakwater was built on the west bank of the river, also intended to be carried out to sea. This, likewise, has been washed away. These breakwaters were one thousand feet apart. It was expected that the river current would wash out and maintain a channel between them. It was also expected that some dredging would be done to assist in opening the channel and maintaining it. The channel which was actually opened appears to have been made partly by the current and partly by dredging. It was by no means a full thousand feet in width between the two breakwaters, like the Mississippi channel between the Eads jetties at its mouth, but was a small channel, sufficient for ships, narrow and close along the lower breakwater.

There has been too much said about Greytown harbor, its bar, and its difficulties. One would think it a very unusual case. But along the Atlantic coast of France nature has done very little. The harbors of France are almost all artificial. The usual method is to build two breakwaters out to deep water at the mouth of some river. It answers well enough, as at Havre, and Dieppe, and Trouville.

Recently an American engineer, Mr. E. L. Corthell, has successfully constructed a harbor under quite similar conditions at Tampico, Mexico, where a bar had formed at the mouth of the Panuco River. Two jetties were built of stone, resting on heaps of branches, each 6,700 feet long, and the results have been highly satisfactory. A deep pass has been opened over the bar, twenty-four feet depth of channel obtained, and a large commerce has been drawn to that port. The total cost was about three million dollars. As our army engineers will have charge of the works at Greytown should our government assist in constructing the Nicaragua Canal, it is interesting to note that these engineers are just completing harbor-works at Galveston, Texas, where the difficulties were much the same as at Greytown. Here two jetties have been constructed, the north jetty 25,970 feet and the south jetty 35,603 feet in length, extending out to deep water. A passage has been made between the jetties across the bar, and a channel twenty-five feet deep has been secured. The cost was $6,350,000, but more work was required than will be needed at Greytown.

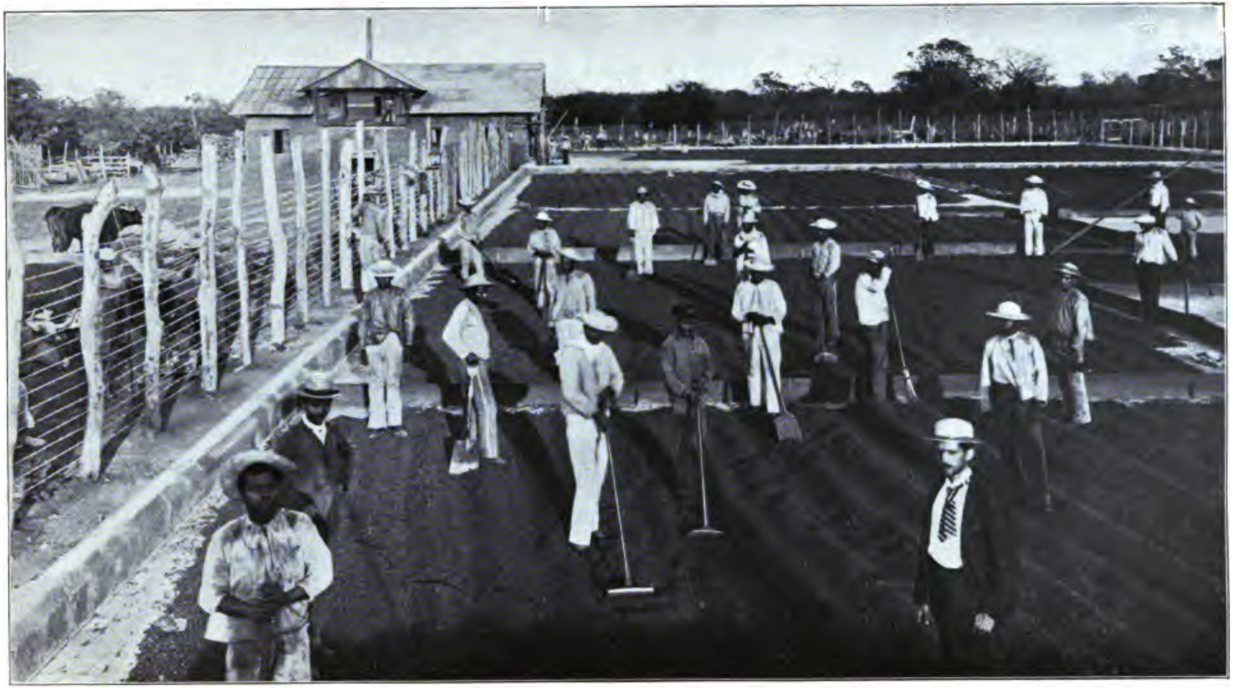
The San Juan River brings down a great deal of sand and mud. This would not be expected, for Lake Nicaragua should serve as a settling-basin, all streams entering it depositing in its bed all matter held in suspension. The San Juan does run full, deep, and clear for many miles from its starting-point at the lake, but thirty-two miles from the sea the San Carlos, a side stream, flows in from the Costa Rica Mountains, and it is this stream which brings down the débris. Sand-bars begin at once when the San Carlos joins the San Juan, and continue at intervals all the way to the sea. It was the sand from the San Carlos that filled up the extreme lower San Juan, caused the breakout into the Colorada River, and destroyed the harbor of Greytown.

The plans for the harbor at Greytown are for the engineers, but a practical man will ask, Why construct a harbor at the mouth of the San Juan? Why deal with that stream at all? Its flow of water for six months of the year, the dry season of upper Nicaragua, is uncertain, always small, and liable to grow smaller should the Colorado further deepen. It certainly brings down a great deal of sand and mud. Is the average for the year, of the scouring-power of its current between two breakwaters, sufficient compensation for the trouble it causes? Would it not be better to cut a channel for the canal directly to the sea, with breakwaters exactly like the Mediterranean harbor of the Suez Canal, keeping away from the San Juan altogether? When the breakwaters are built, this channel would need to be dredged out to standard depth, but after that it would require but little dredging to keep it always clear, as no débris would be brought down by the canal itself. This independent harbor would be simple to construct and inexpensive to maintain, as has been shown at Suez. In these days of advanced engineering a harbor can be built on almost any coast.

The excellent chart of Greytown harbor, made in the Hydrographic Office in Washington, shows that at a point on the coast only two thousand feet above the mouth of the San Juan, it is only a distance of two thousand three hundred feet out to the four-and-a-half-fathom curve, that is, to the waving line of shore, where the water is twenty-seven feet deep. In other words, two breakwaters two thousand three hundred feet long would end in twenty-seven feet of water. From this point, two thousand three hundred feet out, the water steadily deepens, a very important matter. The prevailing winds, which have aided the San Juan River in blocking up Greytown harbor by rolling in sand, are from the northeast, and a small deflection of the breakwaters so as to make their alignment almost due northeast would assist in preventing the sand being carried by the waves around their extremities. The government commission of 1895 reports in favor of an independent harbor, but below instead of above the San Juan.

I wished to examine the place where the canal is to cross a range of hills between Ochoa and the sea, as this is the principal rock cutting, but I was assured it would be a tedious undertaking, of at least a week and perhaps two, requiring guides and a force of men with supplies and camp equipment to cut out a path through the forest. The old clearings made by the company have filled up with a rank, tropical growth, and the country is impassable. Accordingly, I decided to proceed up the river.

It was near the end of the dry season in central and western Nicaragua, where the streams are which feed the great lake, and there not being enough water for navigation in the San Juan, the steamers for Lake Nicaragua ran from the mouth of the Colorado River, sailing only three times a month. At seven o'clock one fine Thursday morning, we started from Greytown on a small steamer, bumped and plowed our way across the bar, sailed southward along the coast, the forest often coming close down to the beach, no villages or habitations being in sight except a few huts, and in three hours we were at the bar of the Colorado. It is similar to the bar of the San Juan, but the sea chanced to be quiet, and there was scarcely a ripple on the bar. As the main current of the San Juan comes that way, the channel is deeper, and we entered the Colorado, hardly knowing when we were going over shallow water. I was told that there were only five or six days



DRYING COFFEE.

in the whole year so free from winds that such a dry and quiet crossing could be made. There was no town at the mouth of the Colorado, nothing but a small warehouse and a custom-house. Our steamer, the Hollenbach, was waiting at the wharf, and, landing at ten o'clock, we went on board at once. I looked into my stateroom, airy and open on three sides, but with absolutely nothing in it, nothing but the floor and the walls. A cot bedstead was presently brought in, and then the steamer company had done their part. It is the custom for passengers to furnish everything else, sheets, pillows, blankets, and towels. It is a very good custom, too, for the tropics. When you retire, your own articles are on the bed. Nothing has been there for years, perhaps, except the canvas on the cot. Indeed, I did not sleep on a mattress, nor see one again, in all Nicaragua. Canvas in the tropics is the best of beds.

It was the coffee export season, and we waited all day until our steamer had discharged the cargo of coffee brought down from above. I have no later government returns than 1891, but in that year Nicaragua had 25,000,000 coffee trees, and exported over 3,700,000 pounds.* Most of the coffee seemed

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***Handbook of Nicaragua. Bureau of American Republics, Washington.**

to be going to England or Germany. I saw thousands of bags on wharves, steamers, and trains, but all were marked either Hamburg or London. The coffee, certainly, is excellent, and is much superior to that which we receive from South America. I was everywhere told that it was of too high price to find sale in the United States.

It being difficult to see the sand-bars at night, we waited until 3:30 A.M. on Friday before starting. I was on deck when we got under way. Early morning on the river was charming, not cool, about the same temperature as during the day, but fresh. The long and short days of summer and winter are less marked as one goes southward, and early in April, in that latitude, I found that the sun rose about 5:30 A.M., dawn coming only a little earlier. Sunset was about six P.M., a short twilight following, and darkness coming soon.

Our steamer was of the flat-bottom type, drawing but little water, with one large paddle-wheel astern, such as is found on our Western and Southern rivers. The main deck was occupied by the machinery, fuel, and cargo, the fuel being wood, supplies of which we took on at various wood-cutters' camps as we went up the river. The Colorado at first was fairly deep, with many turns, and always between heavy forests. Later, we found less water, and much care was required to select a channel. The stream became wider and choked with sand-bars, in appearance very like the Platte River, the Arkansas, or the Rio Grande when the water is low. We needed all the care of our pilot, a native of the country, whose father had been a pilot on the same river before him. In time we came to the place where the main current breaks out of the San Juan to find its way to the sea through the Colorado. We had only a glimpse of the lower part of the San Juan as we passed this point, but could see that its channel was so filled with sand that but little water was going that way. Our progress from that point up the San Juan was very slow. Standing forward, it was never easy to feel sure which one of two or three possible very shallow channels the pilot would select. During the afternoon we passed the site of the Ochoa dam, and soon afterwards the mouth of the San Carlos River, a stream carrying, at that time, little water, choked with sand from the Costa Rica mountains, and causing all the troubles in the San Juan.

On passing the San Carlos, the San Juan at once became a clear, deep river, broad and full, often fifty feet deep. There was no more watching for sand-bars, or special need of the skillful river-pilot who had managed our course all day. I went into the pilot-house and offered to relieve him for a short time. He gave me the wheel, stood by a little while to see how the new-comer got on, and then, apparently satisfied, joined the captain on the deck below to smoke cigarettes. The Hollenbach answered her helm quickly, and I enjoyed the quiet of the pilot-house, the full stream flowing so strong and deep through the forest, and watching the winding course ahead of us.

It is impossible to describe the rich luxuriance of the tropical forests through which the San Juan flows, the beautiful flowers, among them many varieties of orchids, and the brilliant plumage of the birds. The same prodigal forces are seen in operation in the water. The San Juan fairly teems with animal life. As evening came on, fish jumped on every side above the surface of the water. So numerous and so active were they, that the presence of the steamer and its thrashing paddles seemed to cause no alarm, the fish at play leaping in sight ahead, astern, and close by our sides. At one camp where we had stopped near noon for wood, some of the cutters were out on the river in a canoe. One stood in the bow, erect, and after a few circles of the boat threw a spear having a rope attached. They soon brought up the bank where we stood a fish about four feet long, and weighing, perhaps, seventy pounds. They seemed able to spear fish at any hour. The huts of this camp were open on all sides, and the beds, of bark, narrow, and each man's bed by itself, were all built on posts about four feet above the ground, clearly for sanitary reasons.

At dark we reached the foot of the Machucha Rapids, and tied up at the wharf for the night, it being impossible at that low stage of water for any steamer to ascend the rapids. The next day, Saturday, at eight A.M., we were all transferred, with our baggage, to a large flatboat, with a crew of a dozen men carrying long poles with which they slowly poled the boat up the rapids, hugging the shore, and all jumping overboard to push at the worst places. At one or two of these, cables had been laid down in the stream and anchored above. Picking up the small float, which indicated a cable end, our crew laid aside their poles, drew the end of the cable aboard, and pulled the boat up to where the current was less swift. In two or three hours we reached Castillo, where there is an old fort. There are strong rapids at Castillo, and travelers are obliged to go through and above the town to other steamers operating only above the rapids. Great Britain has for many years required Nicaragua to keep Greytown open as a free port,* and those who enter Nicaragua by the San Juan River meet no custom-house authorities at Greytown, the first custom-house being at Castillo. The officers examined our baggage with the utmost courtesy, requiring no duties from me, but collecting considerable sums from some of their own citizens, who were carrying home expensive household purchases.

We stayed at Castillo the remainder of Saturday, and on Sunday at three P.M. took another steamer above the town, a small vessel without staterooms, and carrying two flatboats, one lashed on each side. These flatboats contained a miscellaneous cargo, including the baggage of our passengers. At dark we were transferred to another and larger steamer, where we had dinner, and found staterooms again. I do not know when we started, but on coming out on the deck at dawn we were approaching Lake Nicaragua. We soon reached the starting-point of the San Juan at the lake. The village at the outlet is called

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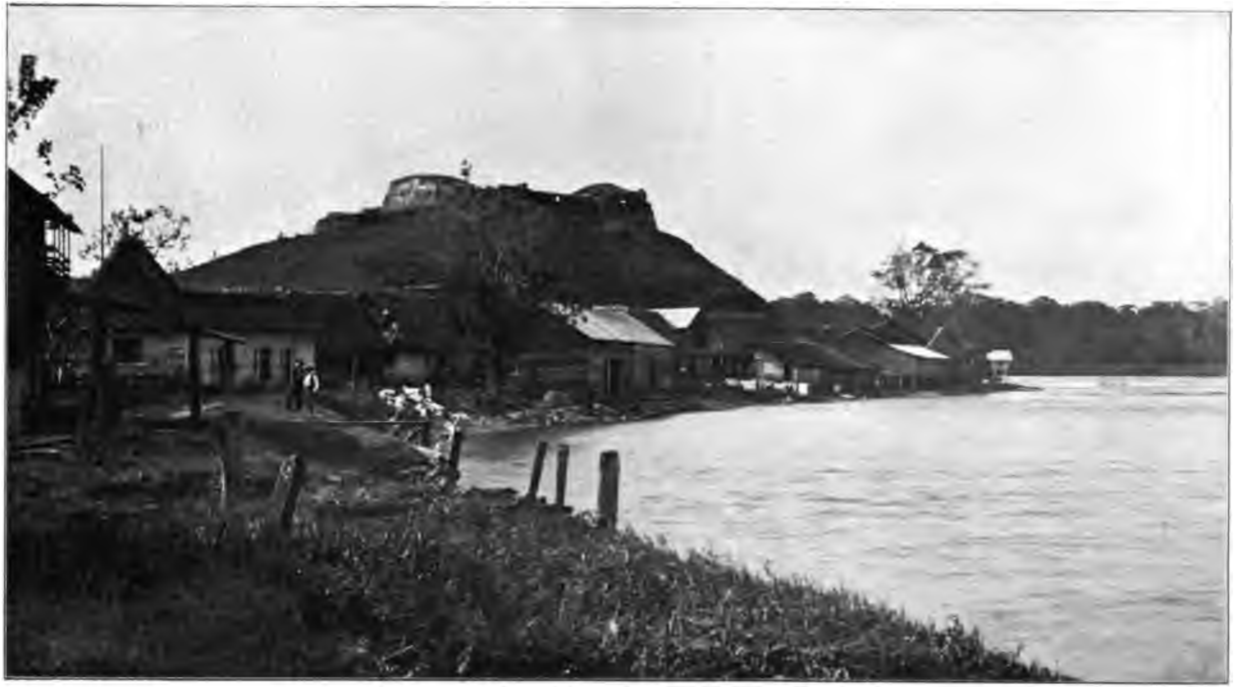
* When we acquired California, Great Britain took possession of the mouth of the San Juan River. The governor of Jamaica, who commanded the expedition, was named Grey, and called the port by his own name. The Nicaraguans never call it Greytown. They say San Juan del Norte,—that is, North San Juan. The coast line at that point is not north and south, but nearly east and west. There is a port of San Juan on the Pacific, nearly opposite Greytown, and this is called San Juan del Sur,—that is, South San Juan.

San Carlos. A fine, large screw-steamer, the Victoria, was ready for us. All our meals on the river steamer had been served at a table on the open deck, but under cover, and it was a change to come to the dining-saloon of the Victoria.

San Carlos is a small village on rather high ground, with still higher ground on its lakeward side, on which is a garrisoned fort. I visited this fort to call on the commandante, and found a fine view on the lake. At ten A.M. the Victoria started, taking a course straight up the lake, a beautiful sheet of water. We soon passed some small islands, and before long had a clear view of the famous island of Omatepe, near the center of the lake, containing two towns and two mountains. One of these tall peaks is called Omatepe. It is not part of a long range, but is a cone by itself, without foothills, and rises 5,570 feet, sharp and clear, above the lake. Being so tall, and also so round and sharp, makes it a beautiful sight. We stopped at four P.M. at the landing of San Uvaldo, on the eastern shore of the lake. At six P.M. we started for the harbor of Mayogalpa, at the foot of the tall island-mountain Omatepe. The sunset was brilliant, and the stars shone brightly, but the steamer tossed about as though every piece of crockery on board would be broken.

I had retired early, and could scarcely keep my place in my bed. Our captain said the next day that it was a regular thing — all the year, a passage from San Uvaldo to Mayogalpa meant throwing about all the loose furniture. It was, of course, the trades, the steady winds which are at once the characteristic and the life of the country. We came to anchor in a quiet bay, and during the night I strolled out on deck. We were near the shore, which was densely wooded. There were a few lights in the town, and high above all, almost over us, rose the tall outline of Omatepe, the sharp cone clearly defined in the moonlight.

At five A.M. the next day, Tuesday, we weighed anchor, and at six A.M. stopped at San Jorge, the port of Rivas, on the western shore of the lake. A long pier extends out to deep water. My baggage was placed on the car of the pier, running on ordinary railroad tracks, and, following it, I took my place in the little railroad train that runs from the harbor three miles inland to the city of Rivas. This city has a population of about four thousand, and the adjoining country is well settled, the department of Rivas having eight to ten thousand population. I stopped at the hotel of James Garret, who for many years kept the hotel at La Virgin, where the coaches



FORT AT SAN CARLOS.

of the Nicaragua Transit Company started, a house which will be remembered by many California travelers.

It is near Rivas that the western portion of the canal begins, connecting the lake with the Pacific. Mr. Frederick Davis of Watkins Glen, New York, who had lived three years at Rivas, with his brother, in charge of the railroad to the lake, had the contract to clear the canal line from the lake to the Pacific for the commission of 1895. He offered to accompany me over the line, and after two days' stay at Rivas, with daily rides over the adjoining country, I started with him early one day for Brito, on horseback. Taking also an Indian guide from the suburbs of Rivas, who had a lifelong familiarity with every trail of the district, we soon came on the line of the canal. There is a well-marked valley from the lake toward the Pacific, a few miles south of Rivas, and the canal follows this valley. There are occasional clearings and small farms, the country being fairly well settled, but almost the whole region from the lake to the Pacific is forest. It is not a dense forest, like the jungle around Greytown, but such a forest as one would find anywhere at home,—large trees, with undergrowth in some places, but occasionally ample space to ride in almost any direction. The only familiar trees I saw were beeches. At one place we passed a large number of monkeys, almost black, making a great chatter in the trees above us. Our course was chiefly near the Rio Grande, a small stream, but with deep banks, telling of heavy floods in the rainy season. Our Indian guide traveled easily ahead of us, his little, hardy mare keeping up a small amble, the same up hill or down, obliging her sucking colt, which followed, to trot nimbly almost all the way. This guide carried the universal possession of all the natives of Central America, a small cutlass, about two feet long, so made as to have the center of weight only about eight inches from the point, called a machete (pronounced ma-chét-tee). These machetes are used chiefly to clear a path through thick forests, but the native falls back on them for every act of the day, to cut tobacco or a slice of bacon, as well as kindling-wood. Curiously enough, the machetes are all made by one man, a Mr. Collins of Hartford, Connecticut, and the natives will buy no others. The European makers send out machetes stamped Collins, but the natives can tell the genuine steel by glancing across the blade when turned up to the light, and they will take no other. Our Indian guide occasionally swung his machete dexterously against a branch overhanging the trail. He never slackened his pace to cut, and one stroke was always enough.

We did not try to follow the very course of the canal as surveyed from the lake to the sea. Sometimes we were near it, and several times we crossed it. The course was cleared only in part. We traveled the usual road for horsemen from Rivas to Brito. At last we found tide-water marks in the stream we were following, the Rio Grande, then heard the roar of the surf ahead through the woods, and at last came into an open space, in full view of Brito headland and the ocean. We tied our horses and took a bath in the sea. There was a fine surf, but the rollers were not large.

Brito headland is a mass of rock, which we did not climb, apparently two or three hundred feet high. The Rio Grande outlet is at the base of the lower side of the headland, and immediately across the river, still farther down the coast, the shore is cut away considerably, indicating that the prevailing currents are all from the northward. It will not be difficult to construct a good harbor, having this bold headland as its basis of protection, and it will not be an expensive harbor to maintain.

It is proposed, and it seems wisely, to divert the Rio Grande, using its present channel for the canal and harbor, but cutting a new and independent channel for the river a little south of the old channel. This will do away with all calculations of assistance of the river to the harbor by scouring and of damage by sand-filling. I had not seen the plan for the harbor at Brito when reaching the conclusion that Greytown harbor would be better made if wholly independent of the San Juan River outflow, but the way in which Brito harbor is planned is a good illustration of how also to treat the Atlantic entrance.

On our return the trail was over ridges of two hundred and three hundred feet in height, and approaching Rivas it took a short cut across some high hills, giving us a view of the white cathedral below and the lake beyond. Crossing these last hills was the highest observation taken anywhere on our saddle-trail, being four hundred feet. Commodore Vanderbilt's stage-road from the lake to the Pacific crosses ridges as high as six hundred feet above the sea. Three miles back from the sea I found the general level of the country was only fifty feet altitude. We stopped to examine the site of the Tola dam, fourteen and a half miles from the lake, which is to hold the waters as far west as that place up to a level with the lake. It is a wooded valley between two high hills, and appeared to offer no unusual features, calling only for the ordinary clearing away of the timber in the valley and the building of a dam. The soil from the lake to the sea was originally volcanic deposit, —a decomposed lava and igneous rock. It is of considerable fertility and easily worked. I could find no data by which to judge how embankments made of it would stand the wash of tropical rains. This is an important subject. There was plenty of rock, not much on the surface indeed, scarcely a loose stone all the way, but croppings to be seen all about on hillsides and under the banks of streams. The natives were as robust, healthy, hearty, pleasant, and apparently as industrious people as one would wish to see anywhere. Their good health, that of the children especially, was marked. They raise, chiefly, cattle, horses, and poultry. All had horses, and rode when they traveled. This western section of the canal will be the most agreeable of all for construction parties. There is no reason why permanent camps should not be established, having fairly comfortable houses, especially having vegetable gardens, so as to furnish a regular supply of almost all the standard vegetables we have at home, as these, with care, can be planted in rotation, so as to ripen regularly and certainly every month in the year. The American windmill* should be introduced in Nicaragua, as no rain falls for six months in the year; and as the trades blow so regularly, there is no reason why every large camp should not have abundance of water for domestic use and for the irrigation of the gardens. Thus there might be a daily supply of fresh vegetables; and the wells should be so deep as to be beyond risk of contamination. Three fourths of all privation in construction-camp life is caused by inefficient management. I have had much experience in hunting, living in tents with guns and guides, far away from any towns or places for supplies, and I have never found any insurmountable difficulty in provisioning camps as healthfully and almost as comfortably as one could desire. All along the western division of the canal the climate is excellent, beef and poultry are abundant; and every large camp should have its gardener and assistants, just as certainly as its cooks. Aside from other considerations, it will pay in the improved health and contentment of the men.

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*The Aëromotor Company, the largest in this country, to whom I have written about Nicaragua being a good field for the sale of their mills, have replied that they have already an agency there, Messrs. Davis Hermanos of Rivas. I have since been recommending their mills to some of the large land-owners of western Nicaragua, and learn that a trial of them, from information gained in other quarters, will soon be made.

The country around Rivas is wonderfully fertile. The soil of decomposed lava can produce grand crops. The chocolate estates are famous, even abroad. The great French manufactory of Menier, whose chocolate is found in every city in the United States, has one of its plantations here, and I was told that the manufacturer never sent the crops to France for manufacture, because they were too valuable for general use. The entire product is sold for consumption in Nicaragua. Chocolate trees bear a pod, and in this pod are several beans. Each bean is about the size of a large almond, and has also a hard shell, like the almond. Break the shell, and the kernel is ready at once for use. It requires to be ground on a flat stone, called a metlate,—every house has one,—some water mixed with it to form a paste, a little sugar added to preserve it, and then it is molded into a cake. The beans, with the shell on, are sold in the markets, and I brought some home. They cost one dollar a pound. I found that to be the price everywhere, and one planter told me his crop was not for sale, as he hoped to get a dollar and a half a pound. The Nicaraguans often stated to me that their chocolate was the best, and brought higher prices abroad than any other chocolate in the world. An accomplished writer on the resources of Latin America states that the world's chief supply of chocolate comes from Ecuador and Venezuela.*

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*The Capitals of Spanish America. By William Eleroy Curtis.

CHAPTER III.

CONCESSIONS AND LEGISLATION.

Public opinion has moved slowly toward consenting that our government should assist in constructing this canal. Until a few years ago, all held that we should have no foreign possessions, but new conditions are making a great change in the old ideas. Congress has been asked to assist construction by the following, among other organizations:

Cincinnati Board of Trade.
Denver Chamber of Commerce.
St. Louis Merchants' Exchange.
Toledo Produce Exchange.
Duluth Chamber of Commerce.
Louisville Commercial Club.
New Orleans Sugar Exchange.
Savannah Board of Trade.
Ogden Commercial Congress.
Chicago Board of Trade.
Nashville Chamber of Commerce.
Albany State Board of Trade.
Charleston Chamber of Commerce.
Kansas City Board of Trade.
Indianapolis Board of Trade.
Portland, Oregon, Board of Trade.
Seattle Bankers' Association.
Wheeling Chamber of Commerce.
Boston Chamber of Commerce.
New York Chamber of Commerce.

President Hayes was in favor of the canal, and spoke of it in his message of March, 1880. President Arthur went so far as to have a treaty negotiated with Nicaragua to carry out construction at once, and President Harrison called the attention of Congress to the necessity of its speedy completion.

Nothing is more marked in the career of General Grant than the way in which his mind broadened out and his grasp on large propositions increased after his military career was over. He urged the building up of the present railroad system of Mexico by the assistance of our people, with an earnestness and effect of which no other man of his time was capable. Far back in the seventies he foresaw the inevitable stagnation of trade, the suffering that would be among our skilled mechanics, should the policy of America manufacturing for Americans only be persisted in; and he pointed out clearly and vigorously the avenue nature had made ready for our use when we should determine to take the first step towards building up some foreign trade, namely, the great avenue southward. When the time seemed to him to be ripe to begin this great oceanic canal, he spoke as clearly and as sagaciously as on other great subjects of national welfare. His foresight was such that he spoke and wrote during all his later life far

A HUT IN THE FOREST.

in advance of the average views and conclusions of the country. Few assented. He will go down in history as having done the missionary work of early advocating some of the most important changes in our national commercial policy. He said, in 1881, of the Nicaragua Canal: "I commend an American canal on American soil to the American people." When he was President in 1872 he sent a commission to examine the route, with Gen. A. A. Humphreys, chief of engineers, United States army, at its head.

President Cleveland, in his message of December, 1894, also called the attention of Congress to the importance of this work. Both political parties have taken ground in favor of the canal,—the Democratic and Republican parties in their national platforms of 1892. The United States Senate has been investigating the subject ever since 1890, John Sherman of Ohio having been, all along, a great friend of the measure. Senator Morgan of Alabama has been of great aid to the canal, and Senator Cullom of Illinois has given it most efficient assistance. In January, 1895, the Senate took up the whole matter most vigorously. A bill was then passed, after full and exciting debate, but did not pass the House of Representatives.

This Senate bill shows the general course of all proposals so far for government aid.

It provides,—

1. The present canal company to continue in existence and the United States to guarantee its bonds to the amount of seventy million dollars, these bonds to bear three per cent per annum interest and to run thirty years, with leave to pay them off at any time after ten years. The company to issue no other bonds.

2. The company to issue eighty-three million dollars stock, of which six million dollars is to be issued to Nicaragua and one million five hundred thousand dollars to Costa Rica as stipulated in their concessions, four million five hundred thousand dollars to the present company in payment of all work done in connection with the canal up to this time, one million dollars to the stockholders, who are to surrender old stock, and seventy million dollars to be issued to the United States in payment for its guaranty of the bonds. No other stock to be issued by the company. All the present stock of the company, issued or not issued, to be canceled.

Note.—The issue of seventy million dollars stock to the United States is intended to prevent any second Union Pacific and Central Pacific railroad experiences. Our government would hereafter hold a majority of the shares, and could practically take possession of of the whole property without a foreclosure, should it ever become necessary.

3. The board of directors to consist of eleven members, one to be appointed by Nicaragua, one by Costa Rica, one by the ordinary stockholders, and eight by the President of the United States.

4. The canal to be constructed under the supervision and according to the plans to be finally prepared by the engineer department of the United States army. The canal company to reimburse the government for the salaries of all government engineers detailed for canal-work.

5. All bonds of the company to be printed at the Government Bureau of Engraving and Printing, and then deposited in the United States Treasury, and to be issued by the Secretary of the Treasury only as the work progresses. The President may, at any time, temporarily stop further issue of bonds.

6. No dividends on the stock are to be ever declared unless there are sufficient net earnings to pay such dividends. Under no circumstances are any dividends greater than five per cent to be declared.

7. The dividends accruing to the United States are to be paid to the government, and deposited by it in a sinking fund. The direc-

tors are to pay into the United States Treasury all net earnings remaining after paying five per cent dividends on the stock, and these are also to go into the sinking fund. As rapidly as possible, the Secretary of the Treasury is to apply all money in the sinking fund to paying off the bonds.

8. All directors must visit the canal and personally examine the works at least once each year. No director appointed by the President of the United States shall own, directly or indirectly, any stock or pecuniary interest in the company, nor shall any director, stockholder, officer, or employee be connected with or interested in, directly or indirectly, any contract for implements, or material, or anything connected with the construction, equipment, or operation of the canal.

The passage of this bill marks the slow but irresistible approval which the general body of the people of the United States are steadily coming to give to this great measure.

In regard to this bill it may be noted,—

1. In asking any modifications of the concessions which have been granted by the governments of Nicaragua and Costa Rica, should any modifications be deemed advisable, it should be kept in view that the canal will enormously benefit these countries. It will give them both cheap transportation to our

Atlantic seaports and to all European ports. It will do away at once with the severe disadvantage Nicaragua now labors under, of having no outlet for its Pacific coast products to the United States and to Europe, except by way of Panama, with reshipment at Colon after a railroad haul across the Isthmus, its fertile region being almost all on the Pacific coast side of the country. Steamers from San Francisco for New York, and great ocean vessels from China, Japan, and Australia, bound for Liverpool, will pass on their way through the heart of Nicaragua, at once making all its European freight rates practically as low as those enjoyed by New York. Nicaragua is likely to have so much new land brought into cultivation as greatly to increase, perhaps double, its population. Costa Rica will have all its fertile country along the San Carlos River, to be reached now only by canoes, made accessible for even large steamers, for the Ochoa dam will raise the now sluggish San Carlos to a broad and deep river, containing twenty feet draught for many miles upwards from its junction with the San Juan. Then a considerable part of the great expenditure for construction will probably go to the citizens of both these countries in payments for supplies, and to some extent for labor.

2. There is no provision in the bill for the reduction of canal tolls as business increases. This appears to have been left to the discretion of the directors. In time, through the operation of the sinking fund, the people of the United States will probably be seeing the guaranteed bonds gradually reduced in amount out of ordinary canal-earnings. Should a canal be constructed in Nicaragua, and prove successful, another will certainly be completed, sooner or later, at Panama, and all vessels bound for the west coast of South America, and perhaps Australia, will take the Panama route. The Nicaragua Canal should prepare early to meet competition.

It is good policy to pay only small dividends, and begin to reduce the mortgage debt at once, as required by the Senate.

3. Equity should be accorded the present canal company. It should have back at once stock or bonds for all its cash outlays to date. The company owns the concessions, and its consent to the action of Congress is necessary. While it is true that the company should abide by its want of success in any ordinary business matter, yet the project it undertook would have been of such great benefit to the people of the United States, had it been successful, that a special case is created. There seems to be a general feeling

that it will be just to grant full recognition of its actual outlays.

4. Exclusive jurisdiction over all civil and criminal causes arising on a reasonably wide belt of canal territory should be awarded by amended concessions to a consular court of some kind, whose judges should be appointed by the United States, Nicaragua, and Costa Rica. The vicious, the lawless, and the outlawed classes will gather in numbers where such payments are being disbursed, and the canal authorities should not be obliged to seek the uncertain protection of the Spanish-American courts. The present concessions contain a special clause that Nicaragua and Costa Rica are to be allowed to establish police stations all along the line of the canal to preserve order, and all expenses for buildings and salaries for such police, including their transportation, are to be paid to Nicaragua and Costa Rica by the canal company. This would not do at all. We could not consent, as a nation, to have the policing of so great an undertaking, lasting so many years, on this basis. There is another still more objectionable clause in the concessions. All contracts for labor made by the canal company are to be passed on by the Nicaraguan and Costa Rican authorities, and all disputes between the company and its laborers, or contractors, between residents and

non-residents of those countries, are to be passed on by the Nicaraguan and Costa Rican courts.

For years Nicaragua has been asked for this canal concession by all sorts of callers. Her wish and hope have been to deal with some responsible people. There seemed no way to act, however, except to take some chances. Accordingly, the present concession was granted in 1887 to a small party of gentlemen who expected to form a company to carry out the work. No capital had been raised, and it was not the time for asking very much. Least of all were the applicants for the concession so circumstanced as to ask territorial jurisdiction, and Nicaragua very properly retained police and judicial supervision over all they were to do in her country. Now the conditions are all changed. The United States, being the party to furnish the means and credit for all construction, may very properly ask the most satisfactory safeguards for construction, and reasonable judicial control over operation and maintenance. What is needed is the establishment of a canal zone, extending a small distance on each side of the center of the canal, to be always under the exclusive jurisdiction of a consular court, whose officials should be appointed by the President of the United States, with one representative each from Nicaragua and Costa Rica.

Sanitary considerations are still more important. These make it absolutely essential to ask for exclusive jurisdiction. Medical surveillance of the strictest kind over the company's employees will not avail if the lands contiguous to its camps are occupied by a miscellaneous assortment from all nations, careless of hygiene, not asking for knowledge, and impatient of direction. The health of Greytown is fundamental for the well-being of the construction camps all along the line of the canal, and Greytown, without other sanitary precautions than Nicaraguan officials can maintain, may become a center of pestilence. To enter the canal zone should require a pass, and to reside within its limits should require a permit, subject at all times to recall when regulations are disobeyed. During construction martial law would be the best basis of government.

Nicaragua and Costa Rica should be most courteously consulted, and beyond doubt they will be glad to be relieved of the care and annoyance of police arrangements, both during construction and afterwards. Their own rights and those of all classes of their people would be always fairly guarded in the consular court maintained by the government of the United States with their participation. It should not be forgotten that yellow fever always exists in Panama on the south and Vera Cruz on the north, that it has appeared in Greytown, though not within twenty-five years, and a severe, rigid medical control, at the latter port especially, will be of the greatest importance.

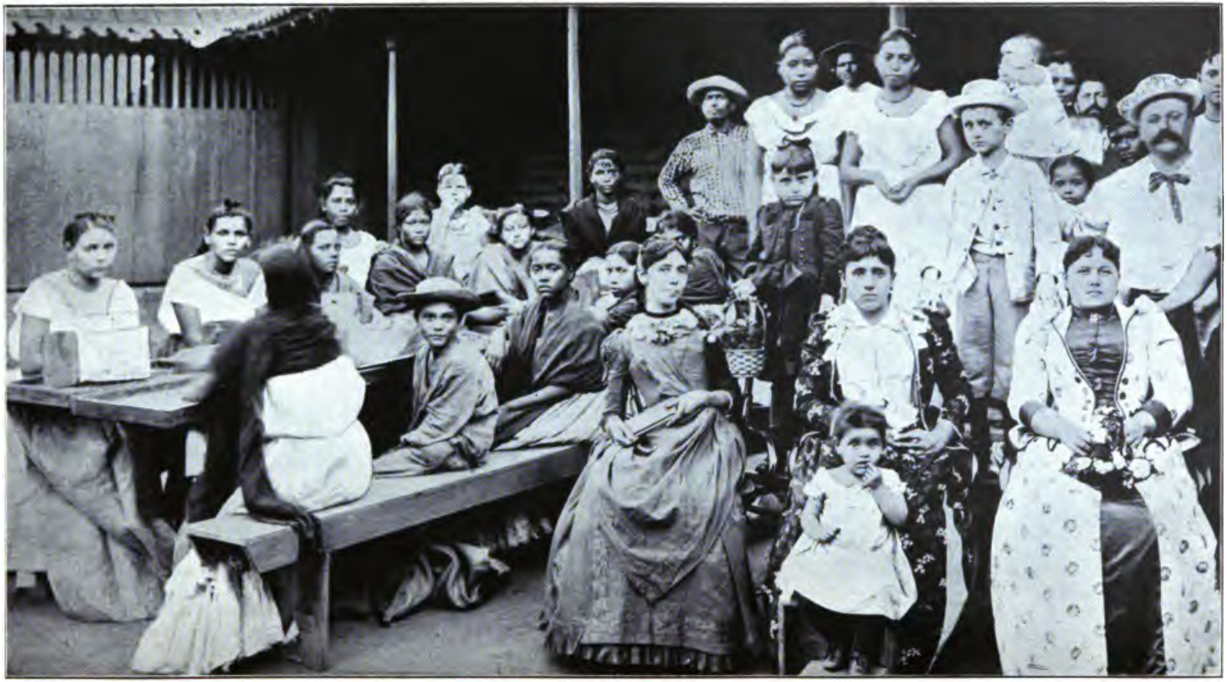
5. American men-of-war should be allowed to pass free. Those of Nicaragua and Costa Rica are to be free, and ours should have the same privilege.

6. There is a clause in the concessions that at least eighty per cent of the net earnings shall be divided among the stockholders. Also that no distinction in rates is ever to be made between ships of different nations. This would, at some future day, conflict with American ships passing free when large earnings shall be no longer required. The vessels of Nicaragua and Costa Rica are at all times to pay half rates only.

The Nicaragua concession contains other provisions which could perhaps be changed, as it requires a canal to be built between lakes Managua and Nicaragua, for the cost of which provision is made in the company's estimates; locks possibly to be built at Ochoa to connect the upper and the lower San Juan, provision for which does not seem to be included in the estimates; and restrictions on the United States ever acquiring the full title by foreclosure. The leading men of Nicaragua are disappointed with the long delay. It is getting clear to them that the United States must grant aid to build. From what I saw of them, and from correspondence since my return home, I think that to get the canal at once they will consent to ownership of a majority of the shares by the United States, and to the United States taking title by foreclosure if ever necessary, as well as any other reasonable amendments of the concession.

As far back as 1825 Nicaragua asked the United States to undertake this canal, and has been favorable to us ever since. It much prefers this country to any other as the builder of the canal. Negotiations should at once be opened, therefore, with their officials, and it should be explained to them that the concession was granted experimentally to a few persons in 1887, the present canal company being next formed to use the concession; that it is a very different matter when the government of the United States comes to them and says that it is thinking of practically contributing so great a sum to assist in constructing a canal across Nicaragua; and that if it should decide to do so it would wish to be reasonably dealt with, and all its property and commercial interests fairly protected. The people of Nicaragua as a class are of keen minds; many have traveled in Europe, and numbers of the younger men have been educated in the United States. Their leading men are good logicians and able to reason well. They also keep well informed about the commercial and financial progress of other nations; and it is very probable that when all the facts are laid before them fully and clearly, they will not only consent, but will consent pleasantly and heartily, to such substantial changes in the concession as will meet the necessary change in the plans of raising capital for the construction of the canal. President Zelaya of Nicaragua is a man of broad views, and is most anxious that his country should prosper during his administration, and his own name be always associated with its history as a wise and sagacious ruler. Of Costa Rica I cannot speak, but there is every reason to believe that it wishes its resources still further developed and will lend aid in all reasonable ways to this great project.

At the session of Congress which ended June 11, 1896, no action was taken, a Presidential election being so near. A bill was introduced, however, in both the Senate and the House, similar to the bill above discussed. It was referred to committees in both houses,



GROUP OF NATIVES.

and both committees reported it back with recommendations that it be passed. The House committee called before it all the members of the commission of 1895, Colonel Ludlow, Mr. Endicott, and Mr. Noble; many questions were asked them as to their visit to Nicaragua and their report, and they all stated that the canal was feasible, advising, however, many changes in the present plans. In the event that Congress was ready to aid in constructing the canal, Mr. Endicott and Mr. Noble saw no objection to passing the bill at once and allowing the engineers to complete the surveys and plans afterwards; and Colonel Ludlow, the chairman, said he would like to see the American engineers have a chance to show what they can do toward constructing a ship-canal there. This last bill before Congress provides that the government shall guarantee the canal company's bonds for one hundred million dollars, instead of seventy million dollars.

At the session of Congress which convened in December, 1896, a bill similar to the former bill was introduced in both houses and was ably debated in the Senate. During the debate, January 22, 1897, the Secretary of State, Mr. Olney, sent to the Senate a letter which he had received from Mr. J. D. Rodriguez the minister from the greater republic of Central America, the three republics of Honduras, Salvador, and Nicaragua having withdrawn their former diplomatic representatives at Washington and formed an agreement for joint action in foreign affairs, under which they have one representative for the three countries. Mr. Rodriguez stated in his letter that he had examined the bills regarding the canal then before both Houses of Congress, and had been directed by his government to say that they were in contravention of the stipulations in the concessions granted to the canal company in some important particulars; among them, that no transfer of the concession could be made to a foreign government, which would occur should the United States become the owner of the canal by a foreclosure. Also, that Nicaragua was authorized to name two of the engineers who should decide on the location, and several other objections. The letter concluded by proposing that the concession should be surrendered, the canal company being evidently unable to go on, and that the United States should come to a direct understanding with Nicaragua on the basis of the Zavala-Frelinghuysen treaty.

The latter was an important agreement. It was made in 1884, during the administration of President Arthur. It was sent to the Senate, and was still pending when Mr. Cleveland took office. He withdrew it because it contained an agreement to defend the territorial integrity of Nicaragua, stating that this was, in his judgment, an entangling foreign alliance. Under its terms the canal was to be constructed by the United States, to be completed within ten years, and to be owned jointly by the United States and Nicaragua. A strip of territory two and a half miles wide, the middle of the strip to coincide with the center line of the canal, was to be set aside for the undertaking, and owned by the two contracting governments. The United States was to have exclusive control of the construction of the canal. When completed, it was to be under the control of a board of six managers, three to be appointed by the United States and three by Nicaragua. This board was to fix all tolls. The net resources, after paying all maintenance and any improvement outlays, were to be divided, one third to Nicaragua and two thirds to the United States. The United States was to loan Nicaragua four million dollars, to be repaid, with three per cent interest, out of the canal revenues becoming due to Nicaragua. The United States guaranteed to protect the territorial integrity of Nicaragua. At this date, February, 1897, no further action than the above described has been taken in Congress.

CHAPTER IV.

THE PRESENT PLANS.

The canal company has been very open from the outset about its charts, surveys, plans, and measurements for excavation and embankments; and many eminent engineers, unconnected with it, have had opportunity of criticism and counter-estimate. The survey-work I have elsewhere spoken of as being of surprising extent. Based on these surveys, they have made an estimate of the total cost — canal, locks, dams, two harbors on the lake, two ocean harbors, lighthouses, railroads, telegraph and electric-lighting lines. The weak point in any such estimate is the uncertain things,— violent storms during construction, pestilence, banks of earth afterwards found too easily softened to hold water, unexpected fissures, rock-cutting where only earth was expected, rock harder than indicated by its upper strata, and a long list of such things. These are called contingencies. The company says it has made a careful estimate of the entire cost, and has then added one quarter extra for contingencies, and this total is $64,043,697. The company's chief engineer is Mr. A. G. Menocal, a civil engineer of the United States navy. He assisted Commander Lull of our navy to survey the canal route in 1871, was chief engineer of the survey of 1876, and in 1885 made the present location and plans. When our government acts and our army engineers prepare the final location, they may adopt Mr. Menocal's plans largely, or not, but his long and efficient services have been greatly to his credit.

In the eastern divide, to make the independent channel from Ochoa to the Atlantic, a small range of hills is to be crossed. The cutting is about three miles long, averages 141 feet in depth and is to be 80 feet wide. This excavation requires the cutting and removal of 7,000,230 cubic yards of rock. There is also a western divide to be crossed, near the Pacific, which contains 5,696,507 cubic yards of rock-cutting. The total is 12,696,737 cubic yards, and the removal of all this rock makes a considerable proportion of the entire cost of the canal. Attention, however, should be called to the fact that machinery has been invented which makes any rock-cutting much less expensive than formerly. The price twenty years ago was $2.50 a cubic yard, but for all such work it is now much lower. The Nicaragua Canal Company estimates the cost of cutting the eastern divide at $1.50 and the western divide at $1.25 per cubic yard. It is not only cutting but removal that demands money, and changes have been made, securing great cheapness in both. Rock-cutting, preparatory to blasting, is now done by channeling-machines, operated by steam, and moving on a railroad track. Each of these contrivances is operated by two men, and cuts a channel ten feet long, three inches wide, and ten feet deep, every day. Cantilevers and cables take up the loose rock after blasting, carry it high up on either bank and deposit it automatically. I have seen a large cantilever in operation, where one man, unaided, took up the steel cages loaded, each with five to eight tons of rock, swung them one hundred and twenty feet high and three hundred feet transversely, dumped them on the bank, and returned them for fresh loads. This man was positively out of sight, in his engineer's house up aloft, giving an automatic appearance to the whole action of the machinery. The latest actual demonstration of how cheaply rock can be cut on a large scale is in the Drainage Canal now being excavated near Chicago. The rock-cutting amounts to 12,330,594 cubic yards. The average cost of cutting and removal is 76 3-10 cents a cubic yard, and the latest contracts have been let as low as 59 cents. The rock is a limestone. Some further details of this canal are given farther on.

It seems important that caution should be exercised by the canal directors in letting these rock-cutting contracts. The channeling-machines were unheard of a few years ago, and still better ones may be invented within a few years more. Then electricity is just coming into use in all construction using steam-power. Should contracts be let for no more than may be carried out within twelve months, lower bids might be obtained at the next letting. The total time required to complete all the rock-excavation is estimated to be five years, and completing this rock-work is the measure of time for completing the canal. The estimate of five years appears to be based on ten hours' work each day. Electric lighting is now, however, so cheap that there seems no reason why the work should not be done by three shifts of eight hours each, excavation going on continuously, and thereby much shortening the time for completion. As there is great exposure to the sun, and to the almost daily rains on the eastern divide, it would be better to have the men work under cover in all places where practicable. Some outlay for shelter will not be expensive, and by the improved health of the men will add to their efficiency.

There seems to be a disposition among the large American contractors, which was discussed before the House committee in May, 1896,* to make bids to build large portions of the work, complete, the committee having been informed that Mr. C. P. Treat of Chicago had made a proposal to construct the entire western division, including the locks and all the work at Brito harbor, and that Messrs. James P. McDonald & Co. of New York had proposed to construct all the eastern division, and even the entire canal. This firm has recently been building a railroad in Jamaica, employing eight thousand men on the work. Mr. A. B. Bowers of New York has made a proposal to do the entire dredging on the canal, including that in the lake and in both harbors; and there is already some talk among contractors of forming a small syndicate of several firms to make a proposal for the entire work. It may be that the directors will decide to let a contract for the whole undertaking to one bidder, or to divide it into two or three large sections. Should they, however, decide to pursue the ordinary plan, some caution should be used. It should be remembered that, at Panama, the American Contract and Dredging Company, organized by McSlavin, on a contract of about twenty million dollars cleared ten million dollars profit.

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* Senate Report No. 1109, Fifty-fourth Congress, first session, page 323.

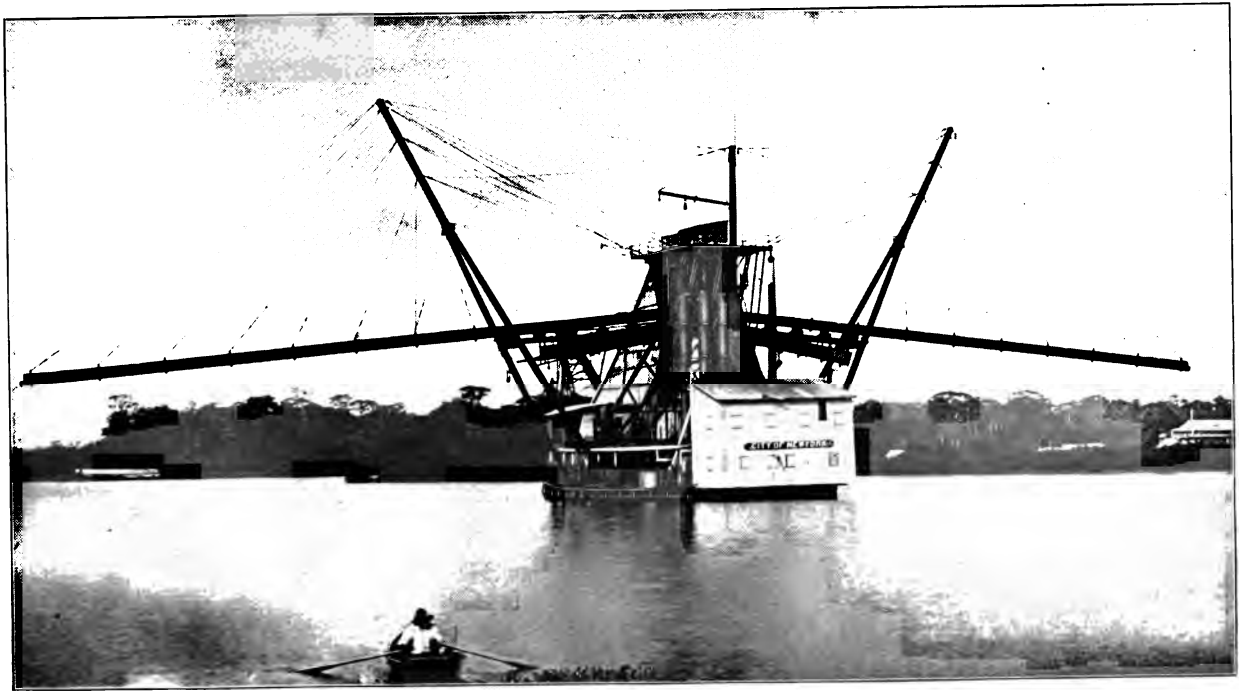
The Ochoa dam will be a great source of energy. Turbines can be easily placed there, and the power carried to the eastern rock-cut, which is only twelve and a half miles distant. As the company owns the water-power at Ochoa, it may wish to use it, and later on may find it profitable to stipulate with contractors that power for all rock-cutting work is to be furnished them. If the dam is to be a rock fill, a fall of moderate elevation will very soon begin to be created there. Power from this dam can be made use of for the electric-lighting, both during construction and operation, and possibly for towing sailing-vessels through the canal.

The locks called for by the plans are substantially of the same order as were used centuries ago. We read that the lock, as a means for raising and lowering ships, was devised by Leonardo da Vinci, the great Italian painter, about four hundred years ago. Why have not our engineers given more successful study and thought to this subject? Their details are better than Da Vinci's, but they have not advanced beyond his general principle. Brick and stone have given way to steel in constructing the tall buildings in our great cities, and the steel building seems to have come to stay. Can steel be used for the Nicaragua locks? A copy of the New Orleans *Picayune*, purchased on the train, while we were approaching New Orleans to sail for Nicaragua, contained a complete description of a steel lock recently devised by a Pittsburg engineer, Mr. C. M. Dutton. The superior elasticity of steel is of importance, should the locks ever be subjected to any special strain by vibration from earthquakes. Steel would yield to any such strain and at once return into its place much better than masonry. The canal company's plans call for locks of concrete. A further consideration is, that the construction of steel locks would chiefly be performed in our northern climate, just as we make steel bridges in Ohio for Chile, and send them to South America, with a few of our own workmen to place them in position. I do not wish to be understood to advocate Mr. Dutton's system. This is only a suggestion. His plans, and any others which can be had looking to steel-construction for locks, should be carefully considered. A drawing of his locks was shown in *Harper's Weekly* of September 21, 1895.

Too much cannot be said about economy in construction and operation. The acceptance of national aid makes construction, maintenance and operation fairly come under national surveillance. There must be an objective point with those who have given any careful thought to this canal. The Senate wisely planned that a large annual dividend should not be the chief purpose. It will be much better to look forward to seeing the canal so administered that the tolls on vessels shall be reduced every year as commerce increases, and that just as soon as possible all ships carrying the American flag shall pass through free. Perhaps the free list might be also extended to vessels carrying American products exclusively.

It is clear that it will take some time to reach the maximum use, as established routes of commerce cannot be suddenly changed, and as the fresh developments of trade which will grow out of this canal cannot all be fully created in a day. The economical method is to build only moderately at the outset, and make additions as increasing trade requires it. Almost all our Western railroads have been built on very moderate plans, first opening communication and securing business, then changing wooden bridges to steel, earth ballast to rock, and trestles to solid embankments, as earnings furnished additional capital for improving. The Suez Canal was constructed on this plan. There may be some feeling that it is better to build largely now, as Congress may never aid again, but this is not well-advised. With reasonable success in administration, the nation will always feel kindly toward the enterprise. As an illustration, a saving of fifteen million dollars at the first construction means four hundred and fifty thousand dollars less bond interest every year; and should enlargement not be needed for sixteen years, as was the case with the Suez Canal, there will be seven million two hundred thousand dollars less interest money to be paid out of earnings.

Some of the western portions of the United States greatly resemble in soil and conformation the western portions of Nicaragua; and if we are to do any work in the latter country, it is fortunate that we have had so much experience in construction on volcanic soils, and in dealing with torrential waters. Too much care cannot be exercised in preparing the final plans for the canal. The mistakes made in western America emphasize this even more than the successes. It is only a few months ago that the Orchard dam in Idaho gave way, the liberated waters carrying away bridges, railroad tracks, and embankments. This dam, with its wings some two thousand eight hundred feet long, and probably fairly well built in most particulars, gave way when the water was ten feet below



DREDGE. IN HARBOR, GREYTOWN.

high-water mark, because the volcanic material of the soil around it, a mixture of lava, sand, and ashes, had cracked under exposure to the excessive heat of the sun before construction, and in time the water had percolated through these undetected fissures. The conditions around the site of the Tola dam in Nicaragua seemed to me to be almost identical. We have, however, an abundance of successful work, also, and should be able, as a nation, to do that in Nicaragua thoroughly well.

Provision should be made from the first for increasing the accommodation when it shall become necessary. Widening can be carried on at the same time that vessels are passing. So can deepening. To increase the size of the locks, however, will cause all traffic to be suspended. The locks in the present plans appear to be too small for permanent use. They are, each, to be 650 feet long, 70 feet wide, and 28 feet deep. To increase the size at the outset will be comparatively a small additional expense, requiring only more material for the sides and bottom. Expense of maintenance and operation will not be increased. The extra water to be used need not be considered, where the supply is so large. It might be well to change the plans for the locks, and make them, each, one thousand feet long. There will be economy, even at the outset, in this, as vessels, if only few in number, need not wait to take their turn. A lock one thousand feet long can lift several vessels at once. The new lock in the Sault Ste. Marie Canal, at Lake Superior, is eight hundred feet long and one hundred feet wide. It is worth noting here that the tonnage passing through this latter canal is greater than that passing through the Suez Canal. In the North Sea-Baltic Canal there are divisional gates in the locks, only a portion of a lock being used for a small vessel,—a very good feature which might well be adopted.

CABLES.

All who are in charge of construction—directors, engineers, and contractors—will, without doubt, keep in view the superior quickness and economy of using the steel cable system instead of trucks, cars, and flatboats for moving materials over short distances, and I only refer to the subject here, that business men in general may have their attention called to a most cheerful and ingenious reduction in cost of construction which has been recently adopted, especially for handling rock. When the new Hemet dam was to be built in California, the stone was in a quarry across the cañon and part of the way up its side.

The great rocks were never lowered to the bed of the cañon, but cables were suspended across the gorge, and on these cables blocks of stone, each weighing five tons or more, traveled from their bed in the quarry quickly and accurately across the cañon, and directly to their exact places in the dam.

At Austin, Texas, the span of the steel cables was 1,350 feet, and across this span blocks of stone weighing eight tons were easily and cheaply carried to the face of the dam being built there. In dam masonry the value of stones as a retaining force seems enhanced by using the largest, and the cable system has greatly aided in handling such blocks at high elevations.

If the abundant rock of which Brito headland is composed shall prove suitable for use under water, the cable system would enable both Brito breakwaters to be built quickly and very cheaply, without any preliminary timber work or the use of cars for handling the rock. The farthest point from the towering, rocky face of this headland to any point on either breakwater appears by the plans to be only about eight hundred yards.

LABOR.

The railroad from Greytown, ten miles across the swamps to the high land beyond, was built by Charles P. Treat, a contractor well known for his experience and success. When the canal company was formed he wished to take some large contracts, but first visited Nicaragua several times to inspect the country along the line of the canal, and then undertook to build the short railroad as a test of the climate, of the labor-supply, and of the efficiency of the labor. In a conversation in June, 1896, he said that the western division could be built by laborers of Nicaragua, Costa Rica, and probably Guatemala, while Jamaica negroes would be better for the eastern division. He spoke in the highest terms of the industry and faithfulness of the natives of Nicaragua and Costa Rica. He was quite clear that the canal could be constructed according to the present plans for less than one hundred million dollars, and that substantial contractors could be found who would undertake to construct it within that sum.

A statement prepared by him was before the House committee in May, 1896. Referring to his railroad work, he says: "There could scarcely be a more unhealthy piece of work during the construction of the entire canal than that was. More than half of the men employed worked in the swamp, in water from their knees to their shoulders, ten hours a day, doing hard work, and not always having quite the proper food, which can constantly be had after the canal work is fairly started. And yet out of about one thousand laborers employed for seven months only two died of disease.

"The men worked steadily. Every morning they commenced at six o'clock, and, except one hour, from eleven to twelve, they worked till five in the afternoon. They then had some daylight still remaining to wash their clothes, bathe, etc. They would not stop for rain, but worked steadily through the rainy season, without protection while at work, all the time during the seven months, except two half-days. There was malarial sickness,—it could hardly be otherwise,—but there was nothing, except the two cases mentioned, which was not cured in a week or so by rest and the proper medicines. At the end of the seven months the men generally were in as good health as at the beginning. They were mostly Jamaica negroes. There were two hundred to three hundred native Nicaraguans and Costa Ricans, and a few negroes from the United States, and from several of the West India and Windward Islands. I believe the matter of health as affecting the difficulty and cost of construction of the canal need hardly be considered more than in estimating the cost of work in almost any part of the United States."

One of the reasons for his undertaking the construction of the short railroad across the swamp having been his desire to study the health of this country and the question of the supply of labor for the construction of the canal, he adds: "I am satisfied that a constant force of ten thousand to fifteen thousand men, or more, can be kept on the eastern end of the work from the island of Jamaica alone. These men are good at task work, and are fairly good in large gangs under foremen. A small number of engine-drivers, excavation and steam-drill men, etc., can be had from the same source, also a good many rough masons and carpenters. They will do good work as stokers on all steam machinery. An abundance of skilled labor and foremen for both divisions of the canal can be procured from the United States and from Europe with no trouble, and without paying very high wages." As to wages for unskilled labor, he says: "The rates of pay, including subsistence, on the whole canal will probably be little more than half the average paid in the United States, and I should say the efficiency of the laborers was also about half that of laborers in the United States." My own observation is to the effect that this is a very reasonable statement of a much-discussed point. Elsewhere he says: "I never had more faithful workers than the natives of Nicaragua and Costa Rica."*

VOLCANIC ACTION.

Nicaragua is undoubtedly a country of volcanic forces; and this fact is kept in view in the planning and construction, both of public buildings and of private houses. One-story buildings are the rule. I found no traces of very recent action, and I saw no mountains from which smoke was issuing. I saw some which were said to smoke occasionally, but they did not smoke at the time of my visit. They are chiefly to the north of the canal line. I did not find any record of any earthquakes during the present generation anywhere along the line of the canal. Some shaking of the earth along the canal is possible. It is in an earthquake country. It is to be noted, however, on this point,—

1. As the crust of the earth continues to cool and contract, the tendency is toward less and less damage by earthquakes.

2. The chief destruction is among lofty structures. Those parts of buildings which are underground are less liable to injury.

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* Senate Report, No. 1109, Fifty-fourth Congress, first session, page 320.

The parts of a canal most likely to be damaged are the locks.

3. Many public works are liable to such special strain as belongs to the neighborhood, and yet they are built and maintained. Railroads in our mountain states are subject to severe washouts. In California these washouts sometimes delay travel for several weeks, and in Arizona I have seen sections where it is said that even the rails were never found, so strong was the rush of the water. This does not stop building railroads in these localities. Take one year with another, and they are operated very satisfactorily. What if some earthquakes should come after the completion of the canal? Suppose some lock is thrown out of position, or some bank is broken and the water of the entire level flows out? Travel will be interrupted, a large force of men will at once proceed to repair the damage, and traffic will be resumed. Another visitation will then probably not occur for several years, according to the tables of earthquakes in the past. Where they do occur, they are infrequent. Mr. John Crawford, geologist, of Managua, formerly for three years on the United States Geological Survey, in Washington, told me he had been six years in Central America, studying the conformation of its rocks, and at the request of

the Nicaraguan government he had recently investigated the scientific aspect of the last earthquake. He had also considered how far any earthquakes would affect the canal, making comparisons with those the country had already experienced. All the waves of earthquake action he had examined, after rising, dropped back at once into their former places. These would not affect the bed of the canal. They might, if they occurred, strain the locks on the Pacific side, but the repairs would not be large, and communication would be only a short time interrupted. This would be the worst to be apprehended; while on the other hand volcanic action and earthquakes were constantly diminishing throughout Central America, and the canal might be free from damage for a century. The commission of 1895 investigated this subject, and concluded that it was not a serious difficulty. They sum up their views as follows:

"The volcanic and seismic forces in Nicaragua are manifestly declining, and there seems little reason to apprehend disturbance of so serious a character as to imperil the stability of canal construction." (Conclusions. Point 19. Page 88 of the Report.)

Should a break occur anywhere between the Ochoa dam and Lake Nicaragua, or between the Tolo dam and the lake, producing so wide a crevasse that the water would be beyond control, a great amount of water from the lake itself would go out before that portion of the summit-level would be sufficiently lowered to permit the repair of the break. On none of the plans which I have examined has there been any provision made to meet this contingency. Retaining gates should be built where both the eastern and western divisions of the canal enter Lake Nicaragua, to be closed in any such emergency.

CHAPTER V.

SANITARY QUESTIONS.

The effect of the climate of Nicaragua on those engaged in canal-construction is an important consideration. The canal company had a famous medical department, efficient, progressive, and very successful, and its carefully kept tables and records seem to show that the general health of all classes of men working on the canal was, if appreciably different, a little better than that of similar bodies of men engaged in ordinary railroad-building in low lands in the United States. This is certainly surprising. They report their losses from all diseases contracted in the country to have been only two thirds of one per cent. This is so small as to be out of the reckoning from a construction point of view. On the other hand, their discipline was strict. No man could stir out in the morning without a cup of strong coffee, and each man was obliged to take a bath and change his clothes at once on coming in when the day's work was over. The sanitary management must have been far above the average.

The primary cause of these good results is, of course, the sweeping trade winds, carrying away all miasma and malaria. Sometimes, at night, at my hotel at Rivas, the walls being carried only part of the way to the roof, so as to leave a clear space above for ventilation, I thought the wind would blow away the red tiles above us. Outside all would be clear, with bright stars and no clouds, but a strong and steady breeze. Lake Nicaragua is full of sailing craft, and I cannot remember, in all my walks and rides along its shores, or when traveling on it by steamer, ever seeing it quite smooth and calm.

As to the effect of excavation on the health of employees, it is not so clear a case. The French did well enough at Panama until they began to dig. I could obtain no satisfactory data. When excavation began at Greytown many said that the experience of the surveying camps was no criterion, and that excavation once having been begun, plenty of fever would follow. The company did excavate, a small part of the canal was dug, but no unusual fever appeared. To this it must be said that the soil near Greytown is chiefly sand, and not the usual bed of fever germs. I looked about carefully, but could learn of no experience with large excavations other than the canal company's, and reached no conclusions on this point. Strictest medical oversight after excavation begins will be of fundamental importance.

Another point to be considered is, that the company should itself build all camps and supply all provisions for all persons employed, and not leave this to its contractors, who employ the men. Too much stress cannot be laid on this. The medical service should also all be furnished by the company, and be under its exclusive control.

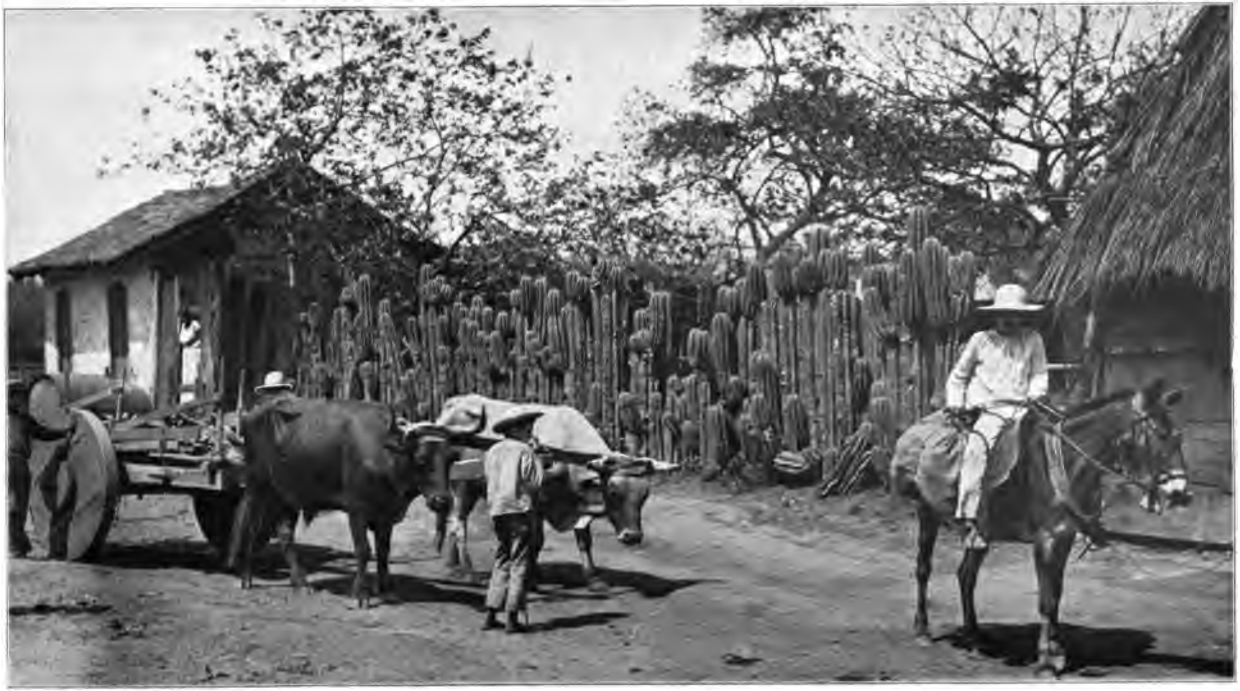
The central and western zones of Nicaragua are dry for six months and always windswept, but it will not do to say they have no fever. They are tropical, and not very high. Health for strangers in the tropics is dependent on elevation. When I was in Managua there was no fruit to speak of for sale in the fine market, the building covering a square and built by an English company. I was told, as the reason, that there was so much fever among the people that the government had temporarily forbidden the bringing of fruit into the city. But it is just because the country is not elevated that a canal can be built there. Nature does not contract to make smooth the path of civilization.

The inhabitants of northern countries cannot easily appreciate, without a visit to the tropics, the necessity of careful sanitary regulations and a strict quarantine. When a fever is spoken of they naturally think of an illness lasting six to eight weeks. The tropical fevers sometimes run their full course in six to eight hours. By that time the patient is either convalescent or dead. The same forces of nature which will in six months, by a new growth, wholly obliterate a road through the forest near Greytown, will develop the germs of a disease with a corresponding rapidity. The chief attention needs to be given to measures of prevention, and in securing these, members of Congress, and all who have to do with planning the administration, can accomplish far more than any medical department dealing with sickness after it begins.

From conversation with local physicians, old engineers of the canal company, and large land-owners, as well as from my own observations, the following seems to be clear:

1. If canal-construction is carried to completion there will always be some malarial fever cases in the camps and hospitals. These cases will be successfully treated in the main. There will not be enough of these malarial cases to impair seriously the general efficiency of the construction forces.

2. Yellow fever may be brought in from adjacent countries, but can be kept in check



STREET SCENE, NICARAGUA.

by isolation. There is none now, and I could find no records of its having existed on the line of the canal for twenty-five years. Typhoid fever and typhus fever may appear in scattered places, chiefly through the use of waters not potable, but they can be managed by isolation. The pernicious fevers are not likely to appear at all. The above conclusions are strictly on the basis of rigid sanitary discipline during construction.

PRECAUTIONS.

A few precautions are given which may possibly be of service to persons merely traveling in Nicaragua. Residents will, of course, make a study of the subject, and will acquire much more minute information.

1. Keep out of the sun as much as possible. If obliged to be out in it, carry a sunshade or umbrella.
2. Eat no fruit.
3. Take a cup of coffee at once on rising in the morning.
4. Keep indoors after sunset, or at least under some piazza, where dew cannot fall on you.
5. Let the water alone.

These rules are simple, but require to be adhered to. The leading one is about the water. The North Americans who have been there a long time—and they are everywhere—are acclimated, and what they may safely do is no standard for a stranger.

The increase in capital and the fall of all interest rates in this country are certain to result in a great amount of American investment in the countries south of us, involving all kinds of construction, and it would be desirable that the medical department of the canal company should keep this in view. All their work could be tabulated as it progresses, and very advantageous reports and suggestions could be prepared in permanent form for the use of other American undertakings. The greatest value is in data recorded at the time, while fresh in the mind of the observer. Such data, along with practical suggestions as the result of the experience in Nicaragua, will be of the greatest benefit hereafter, and it will be desirable to have this kept in view from the outset of the work of the medical department.

The proper house-accommodation for laborers is not only a question of humanity, but goes directly to the efficiency of all operations. There are enough data available about tropical work to make fatal mistakes avoidable. Camps should be on high land wherever possible. In our northern climate the limit line of malaria is about twelve feet above the ground. Farther south it is higher. In the eastern division railroad-construction should be pushed to completion at once, and, where necessary, the men should be taken by train at the close of work to camps on elevated ground. The mischief is done, in the main, between sunset and an hour after sunrise, and the minimum of exposure during that period is most desirable. Mr. Colquhoun speaks of this as a man experienced in work in hot countries, and he noticed that in the largest work, cutting through the eastern divide, the men could be protected by living on high ground. He also recommends conveying the men by rail to the work on the lower ground between the divide and Greytown.* I observed at Panama that although the engineer officers built their houses on the hilltops, the cabins of the laborers were often on the lowest lands, as close as possible to their work, though with a little care quarters could easily have been found almost equally near on higher ground. There was also a railroad in daily operation, which might have been utilized. All the conditions were unfavorable, even with the greatest care; but more care could have been exercised. Altogether the mortality among the laborers brought from Jamaica was so great that the government of that island was obliged to object to sending more men. Probably at Nicaragua the largest drafts for labor will be from Jamaica, the natives of that island being by far the best adapted to such work, and early attention should be given to their care. It is vain to leave this subject to the contractors who employ the men. They are, as a class, harassed with difficulties, and often laboring under great financial strain to furnish the large sums of money always necessary for their great outlays before payments can be made to them by the company, and will naturally practice every economy in their construction camps. The subject should be under the control of the directors and receive their earliest attention. There should be a committee of the board expressly on the housing and food of the men. It should be the pride of the directors not only to complete the work with the best machinery and at the smallest cost known in modern construction, but also to make a record for the latest and best sanitary arrangements, and the least mortality among the men.

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* The Key to the Pacific, The Nicaragua Canal. By Archibald Ross Colquhoun. Page 118.

THE TRADE WINDS.

So many considerations of health and climate in Nicaragua depend on the trade winds, that a few words about them may not be amiss. Their origin is simple enough. The great heat at the equator causes the air over the equatorial zone to ascend. As it rises, colder air comes in from the north and south poles, and the intervening regions, to take its place. This would give in the northern hemisphere a steady north wind, which would be most perceptible on approaching the equatorial zone. The earth is revolving, however, and all objects on it at the equator are being carried eastward at the rate of seventeen miles a minute. The wind from the north is influenced by this motion, and its direction is changed from a north to a northeast wind. At the equator itself there is a region of calms, the bane of sailing-vessels. South of the equator the trade is a wind from the southeast. The region of the north trades is between 7° and 30°, north latitude. Greytown is in 10° 55′ 14″, and Brito in 11° 20′, north latitude; thus the whole route of the canal is fairly within the region of the north trades.

TRAVELING.

Something may be said with advantage to travelers as to what to carry and how to carry it. The best advice I have seen anywhere is from a writer on Honduras, who suggests taking two steamer-trunks. On steamers one can go in the hold and one under the berth. In cities, porters can readily carry them to your room, one at a time. Moreover,—and this is the chief point in his suggestion,—in those long journeys on horseback, which are so necessary for almost all travel in Central America, two steamer-trunks can be easily packed on a mule. One goes on each side of the pack-saddle, with the flat side toward the flanks of the mule. Packing is quickly done; when once bound on, the trunks stay, and in passing among trees, bushes, or through narrow places among the rocks, they do not project very far.

In Central American travel, your quantity of baggage varies. You are using things, like supplies, or adding things, like souvenirs. There are always, too, a lot of things you do not exactly care to pack in your trunks, sometimes bulky articles. Then there is soiled linen. Who has ever found just the place for it in a trunk? A long, leather bag, rather round, like a mail-bag, say three or even four feet long, is most valuable. Have a strap around it lengthwise to take up any slack when it is not full. Also a padlock, neat but stout. It has three good points — it is durable, can stand any amount of hard usage; it is elastic, carrying all bulky articles, and all overflow, the things discovered after you thought everything had been packed; and it can be readily carried on a mule, strapping it on lengthwise and between the trunks.

An experienced traveler in Central America has made a valuable suggestion, namely, to carry a small dressing-case or handbag strapped on the mule above all the baggage, and containing towels, soap, brushes, and anything you may require at the halt for lunch, as unpacking baggage is troublesome. Then, at any time in the day's journey, when you come to a clear, cool stream, you can have a bath with small delay. I should add that your sheets, pillow and pillow-case can go easily in that long bag, made up in one small parcel, and your blanket will be better there than outside in the dust. It is better to carry plenty of the articles you may require, as it is not so easy to purchase little requirements in Nicaragua as at home. What you would need during July or August at home is essential. The only limit is the amount a mule can carry. By common usage the load of a mule for a traveler's baggage is from 200 to 250 pounds.

EXPENSES.

Traveling is not expensive, when converting our gold into Nicaragua silver is considered. The usual rate at ordinary hotels is $2.50 per day. A dray and mule sent specially to the hotel to carry my baggage to the wharf cost fifty cents. Residents paid twenty-five cents. The tip for any small favor is half a real, five cents, or to be liberal, a real, ten cents. A covered carriage and two horses in Granada costs one dollar an hour. Saddle horses cost about $1.50 a day.

The people of Nicaragua, in common with those of some other Latin-American countries, seemed to like the fall in silver very well, and to be prospering by reason of it. When interest is to be paid abroad, or any purchases made in gold countries, it is rather hard on them, as buying one dollar of gold takes two dollars of silver. Accordingly, they are trying to reduce their imports, and it is easy to manage this. For all they export, however, they are now receiving two dollars for one, coffee, their chief export, bringing double its old price; and as all prices at home are unchanged, labor, food, and all domestic supplies, the people are feeling very prosperous. Some costly new buildings at the capital were pointed out to me as a result.

CHAPTER VI.

THE COUNTRY AND THE PEOPLE.

Nicaragua contains about forty thousand square miles, as large as Maine, Massachusetts, Rhode Island, and Connecticut combined. It has about three hundred miles of coast line on the Atlantic and two hundred miles on the Pacific. The population is 360,000, made up of 16,200 whites, 1,800 negroes, 144,000 mixed races, and 198,000 Indians. It presents three distinct zones of climate and products.* The Atlantic side is heavily wooded, a tropical jungle, producing bananas, mahogany, and India-rubber. The central portion is in part forest and in part open prairie, the chief industry being cattle and horse raising. The Pacific portion contains all the chief cities, and is extremely fertile, producing coffee, chocolate, and Indian corn. Nicaragua belonged to Spain, as a colony, from 1568 to 1821, when it became free. It is a republic, having a President, Cabinet, and Congress, and a constitution very like ours. It has 122 miles of railroad, completed in 1886, and 1,454 miles of telegraph, all owned by the government. The latter asserts that its railroads earned in 1890 a net profit of $108,000, and that this is 6⅓ per cent on their cost. A telegram of ten words, sent anywhere in the country, costs only twenty cents. There is cable connection with other countries, the charge to the United States being $1.02 per word. The national debt held abroad, chiefly in England, is $2,105,227.07. No interest has been paid for eighteen months. Up to that time the interest was kept paid. The rate is six per cent. The debt held at home is $932,309.20. The resources are abundant, the gross revenue of the government for 1890 having been $2,847,729.08. With careful management the entire national debt could be easily cared for, and eventually paid up in full.

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* Central and South America. By H. W. Bates.

The United States sold to Nicaragua in 1890 goods to the amount of $811,978.41 and purchased goods costing $1,169,050.64. Its total exports were $3,833,614.28, and imports $4,268,405.27. England sold Nicaragua more than any other nation, $1,324,526.89.* These figures of exports, imports, sales, and purchases are all for gold.

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* Handbook of Nicaragua. Published by the Bureau of American Republics, Washington.

A TROPICAL ROADWAY.

CURRENCY.

The money of the country is partly silver and partly paper. The Bank of Nicaragua issues notes as small as twenty cents, and its bills are current everywhere. The chief silver coin is the Peruvian dollar, well coined, and the smaller coins are fifty cents, twenty cents, ten cents, also called a real, and five cents, called a half-real. The rate of exchange was usually two hundred. I carried ten-dollar American gold pieces, and exchanged each of these at banks, hotels, and many shops, for twenty silver dollars.

STEAMER LINES.

The most comfortable way to reach Managua, Granada, or any of the Pacific coast districts, is by way of New York to Colon, seven days' sail, crossing the Isthmus by rail to Panama, then by steamer, three days' sail, to Corinto, the chief port of Nicaragua. Thence a railroad runs up to the lake. Most of the citizens of Nicaragua use this route to visit the United States or Europe. The fare from New York to Corinto is one hundred dollars, gold. On the Atlantic coast, Bluefields has a large commerce, but has no rail or telegraphic communication with other parts of the country. The fare from New Orleans to Bluefields is forty dollars, gold. There is a steamer up the river sixty-five miles, to Rana, and from there a trail across the mountains leads to the lake, about six days on horseback. There are few steamers to Greytown at present. A line from New York sends a steamer there at uncertain intervals, and an English steamer runs from Colon to Greytown and thence to Liverpool. Should canal-construction begin, it is expected that regular lines will at once be in operation from both New York and New Orleans, as there will then be business to support them. The Bureau of American Republics at Washington, a government bureau of which Mr. Clinton Furbish is director, has prepared a small volume called the "Handbook of Nicaragua," which the government sells. It is compact, well prepared, full of useful information about the country, and is of great service for traveling in Nicaragua. There is a similar handbook of each of the Spanish American countries, and all persons intending to visit or do business with any of them are recommended to obtain the government's book.

CLIMATE.

It should be noted that there are no hailstorms in Nicaragua, no snow, ice, cyclones, nor any violent windstorms. Although the sun is so hot, sunstroke is unknown. On the

Pacific side there are two seasons, wet and dry. From November 1st to May 1st there is no rain, and the grass grows brown, although many trees retain their green leaves. From May 1st to November 1st is the rainy season. In the Central and Pacific zones of the country the average annual rainfall is not well known, but observations taken one year at Rivas showed 97.44 inches. For comparison it may be noted that the annual rainfall in our Northern states is about thirty-two inches. The Atlantic side of Nicaragua slopes toward the hot Caribbean Sea, whose damp winds are constantly bringing moisture to the land. In Greytown there is more or less rainfall all the year, and the annual fall is about 296 inches. Most of the precipitation of the rainy season is in showers during the afternoon, or at night. Occasionally, however, there is a severe downpour. I could not find any traces in the country of cloudbursts in the elevated regions, and feel assured that this specialty of our own trans-Missouri rainfall does not occur. For comparison it may be noted that the extreme rainfall in England, in the lake district, is 146 inches, and in the Khasi Hills, in India, the records show 493.19 inches. At Vera Cruz it is 146 inches.

All engineers who look at these pages will ask at once what effect that 296 inches of rainfall at Greytown has on the San Juan River. As I visited the country in the dry season, I cannot speak from my own observation, but I was told that so few of the streams on the Atlantic slope flow into the San Juan that it is not liable to excessive floods. Again, it drains the great lake above; and after heavy rains in the upper country the lake receives most of the sudden accessions through the streams flowing into it; but it is so large as to rise very slowly, and the San Juan, at its outlet, rises only as the lake rises. In other words, the lake acts as a regulator on the San Juan. Below the Ochoa dam, along the last reaches of the river, which it has been decided to abandon as a course for the canal, I was told that there was a liability to overflow.

I took occasional observations of the temperature in the upper country, where it is considerably warmer than in the even, moist climate around Greytown. These were not made systematically, as a weather-observer would arrange them, but were only such as a chance traveler might note. My room in the Grand Hotel, Managua, facing west, was on the second floor, was about fourteen feet high in the clear, and was without ceiling, the sharply pitched red-tile roof sloping away on each side from a ridgepole across the middle of the room.

The following observations were taken in this room:

April 15,	6:45 P.M.	92°
April 16,	6:00 A.M.	87°
April 16,	9:00 A.M.	89°
April 16,	12:30 P.M.	92°
April 16,	8:40 P.M.	93°
April 17,	2:00 P.M.	97°
April 17,	8:30 P.M.	93°
April 18,	5:30 A.M.	88°
April 18,	10:45 A.M.	90°
April 18,	4:30 P.M.	95°
April 19,	4:25 A.M.	88°

First shower since October, 1894, lasting from 4:25 to 4:33 A.M.

April 19,	6:55 A.M.	89°

On the 17th, out on the balcony of the room, in the shade, at one P.M., it was 101°, and on the 18th, at the same hour, 102°.

RIDING.

Nicaragua is a country of riding. The horses are not large, averaging fourteen to fifteen hands, but of excellent disposition, and all trained to an easy pace. Few trot under saddle. At Managua I rode a well-bred five-year-old, and in a day or two taught him to trot, but one could see it was a strange thing both to him and to the people. The latter do not like this gait, and after a new servant has been at a house a week or two, and is not doing as well as at first, they express it in Spanish by saying he has "begun to throw out a trot." Riding is usually the most available exercise. Horses are abundant and prices are low. A good animal can be had for fifty dollars in the towns and for much less on the ranches. The saddles are usually of English manufacture, and resemble the quilted saddles used in Kentucky, easy and capacious. The bridles are of one rein, fitted with a moderate curb-bit. Horses are not shod, as a rule. They are not equal to jumping, being able to rise well enough, but not having any propelling power in the hind quarters. Those who are accustomed to riding regularly will do well to take to Nicaragua a favorite saddle, and any other articles for riding they especially like. The pace of the horses is so easy that even those not accustomed to riding can manage them comfortably.

The climate of Nicaragua is so equable, and housekeeping so manifestly assures greater privacy and increased comforts in a foreign country, that a few words about suitable houses for engineers, department officials, and the whole force of better-paid men, may not be amiss. Small houses are built now, complete for shipping to any part of the world, and do not require skilled workmen to set them up on arrival, all the parts being numbered. Plastering is not required; the open air is so pleasant that the verandah is always the most used place, and comfort is attainable without so much space as is required in our Northern states. Rates of freight to New Orleans are very low, and also from New Orleans to Greytown. The canal company, to improve the morale of its employees, would undoubtedly give cheap, perhaps free, transportation to such building material from Greytown to any camp on its line, and also from camp to camp at removals.

I suggest, for the benefit of builders, a few changes in the houses to go to Nicaragua. Ventilation, capable of being closed, should be provided at the top of all side walls. A verandah of liberal proportions, an inexpensive feature, should always be added, with space and hooks for hammocks. A second roof, such as is seen in some Arizona houses, is most imperatively necessary for central and western Nicaragua, to temper the great heat of the sun. This should be about six inches above the first roof, which can be of grooved boards only, and the space between the two roofs should be always open on all sides for circulation of air, with one or two small openings in the upper roof at its highest points for the escape of the heated air. These small portable houses are shipped to California, Mexico, and South America. A house of three rooms, sixteen by twenty-four feet, can be had for $110, and one of three rooms, sixteen by thirty-two feet, for $150. A hunter's camp, sent to a gentleman owning property in Dakota, cost $210. It was sixteen by thirty-six feet, had three rooms, each twelve by sixteen feet, a verandah eight feet wide on one end and one side, each room opening on this verandah, and was suitable for two engineers who might wish to camp by themselves.

HABITS OF THE PEOPLE.

The country appeared to be well policed, and the disposition of the people friendly toward strangers. I was constantly going about in the towns and cities during the early evening, and traveled on horseback generally alone. I was never molested, or even annoyed. I always made it a rule to speak to every man, woman, and child along the road, and my salutation was usually returned pleasantly, and frequently with cordiality. I was accustomed to dismount whenever I wished to ask for coffee and tortillas, or even only to chat, sometimes at out-of-the-way houses on by-roads, or in the forest, and always received the best attention and civility. It is fair to add that every woman in Nicaragua seems able to make good coffee, and some of that called for at unexpected hours, and prepared at once, at very small houses, was far superior to anything one could find at even good restaurants in this country. Mr. Thomas Belt, who was four years in the country, from 1868 to 1872, says: "As far as my experience goes, highway robbery is unknown in Nicaragua. I never carried arms for defense, often traveled alone, and was never molested. The only dangerous characters in the country are the lower class of foreigners, and these are not numerous."*

I have found, thus far, in Latin-American countries certain faults, but also certain virtues we cannot boast of. Their faults are largely those of climate and descent. We, who are of Puritan ancestry, or of sound Holland or German stock, should remember that frankness, truth-telling, and sincerity, in order to be found as among our people, have required long descent, through thoughtful, reading ancestors, specially favored in development by climatic conditions. We should remember, too, that these Latin-American countries were colonized by military men from the south of Europe, who rarely brought their families with them. Alliance with the native races was from the outset essential to the maintenance of European influences in those countries. The men who are there to-day did not create these conditions. They were born under them. Averages in statistics of morality are as reasonable as in other statistics, and in some virtues these men excel us. For one thing, individuals pay their debts, bankruptcy and compounding with creditors being practically unknown. Their commercial obligations are good paper. I am speaking of the natives, not the foreigners, there. Extensions may be asked, but payment can be absolutely relied on. Certainly, this is an honorable trait in any nation.

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* The Naturalist in Nicaragua. By Thomas Belt.

Another excellent quality in the people of Nicaragua is the attachments in domestic life, those between husbands and wives, parents and children, being far superior to what is usual in this country. It was indeed pleasing to see substantial men past fifty years of age attentive to the smallest wants of their wives. Everywhere I observed husbands manifestly happy in conjugal companionship, real companionship, and not simply an alliance. Age did not seem to bring the slightest difference.

The children, too, are on a footing of greater tenderness, the affection of parents of all classes being very marked. Everywhere the children had the manner and the bearing of having always existed in an atmosphere of affection.

The heat of the sun appears to be a great factor in customs and in morals. Americans permanently residing in Central America in one or two generations always come to the ways of the country. Their descendants become Central Americans. The type yields to the climate. No matter what the ancestry, the training, or the resolution, the children will be modified by the climate. The English have recognized this law in their administration of India for more than a century. The governing race do not remain there. After twenty years' service, all officials, military and civil, return to England with their families on a pension for life, and new men are sent out to take their places. Plants and animals when taken to Central America fall under the same law as men. Horses of the very largest breed will, in time, come to the smaller size of those in their new home. Consideration of this irresistible law should make us more charitable in our judgment of the people of southern countries. If placed there, we should all, in time, become very like them.

The architecture, social customs, and cookery are all Spanish, but considerably modified from those of the Spain of to-day. Chocolate, for example, is not only made with milk, as in Madrid or Seville, but there is a capital combination for hot weather, called tistie, which is chocolate with a little parched corn, served cool in special cups cut from the gourd, some of them beautifully carved. I found the people extremely agreeable, especially the native race, who are alert, active, vigorous, and hospitable.

Many travelers in our sister republics in Latin America speak depreciatingly of the people, their hotels, food, and customs, and in the same breath complain of the discomforts they themselves experienced. Americans about to visit Mexico sometimes criticise the country even before starting, and on arriving there feel disappointed, abundant means bring them so little pleasure. In expecting all the little courtesies, the small attentions, which make the way so pleasant for a foreigner, they are like men drawing checks on a bank where they have never made deposits. The people of Latin America are even more sensitive than the Americans, and they are also more intuitive. In traveling among them, if we wish to receive attention we must first show some consideration for them.

In my own case, whatever the reason may have been, I can only say I had a delightful journey throughout. The best staterooms on the steamers and the best quarters in the hotels seemed to fall to my lot without even a request for them. Somehow I got not only good horses everywhere, but sometimes horses of value, such as would not ordinarily be hired to a traveler; the officials were very courteous, the servants extremely accommodating, and the most marked attentions received were sometimes from chance acquaintances made while traveling. All the journey went well.

The next industrial stage in the United States will be manufacturing on a large scale for other countries, especially Latin America. The increasing charities asked every winter for worthy men out of employment show that our country cannot longer consume its own products, and we have reached a time where we are really beginning to need this trade. Acquaintance precedes all commerce, and business affairs are now largely built up on courtesies and friendships. Every American, whatever his errand or station in life, who visits the countries to the south of us does something to promote or to delay this needed commerce. To aid it, the chance traveler can be of assistance as truly as the great merchant or manufacturer. Even a child in a family party traveling for pleasure in Mexico, by smile or kindly word, can leave behind an impression which, however small, helps to smooth the way for this coming commerce.

CHAPTER VII.

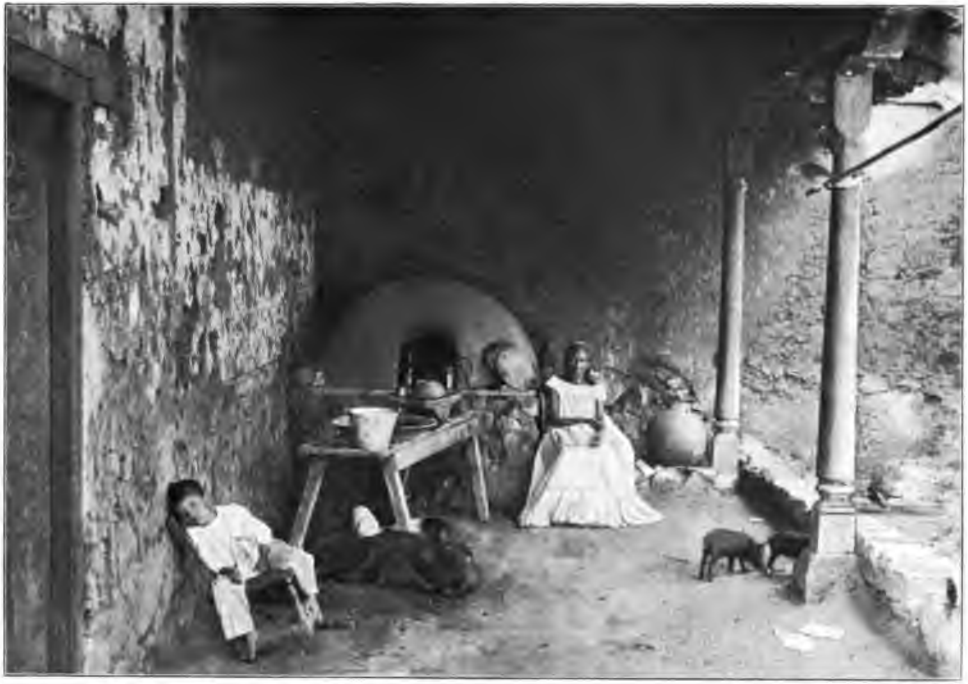
OTHER GREAT CANALS.

The situation in Nicaragua having been examined, the ship-canals in use in other countries became of interest, and I visited the Manchester and North Sea-Baltic canals, and made some study of the Suez Canal. Knowledge of each of these enterprises throws light on any similar new undertaking.

SUEZ CANAL.

The ship-canal whose trade relations and daily operation most resemble the situation in Nicaragua is the Suez Canal, and for this reason a brief outline of its history, construction, and operation up to this time may be of interest. After some correspondence with the officials of the company on my return from Nicaragua, I had the pleasure of making their acquaintance at the company's fine offices in Paris, in August, 1895. The officials knew, in a general way, of the proposed work in Nicaragua, and while devoted first to the interests of their countrymen in the Panama Canal, yet were ready to show me every courtesy and impart information as to their experience in Egypt. The company occupies its own building, and M. de Rouville, the chief administrative officer, who manages such a successful business, and who had the bearing of a very superior man of affairs, received me in the large room of the council of administration, or what we would call the board of directors. We sat at the long oval table of the council, with fifteen or twenty chairs around it. In the center was a specially large chair, which they told me was the place of the president, where De Lesseps had sat for more than twenty years, when presiding over the council. High up on the wall opposite his seat was his bust in bronze. On one of the side walls was a chart of the canal in colors, and on the opposite wall, a cast in high relief, showing all the elevations and depressions. Above each of these hung a large painting of some Oriental scenery, enlivened with a few figures of Arabs in white. The subject of one picture was the first flow of water through the canal. Later, the chief engineer, M. François Vieussa, was called in, and our talk was so pleasant that it ended in his taking me across to his own quarters, in another part of the building. I had previously sent him some accounts of the progress of the work on the Chicago Drainage Canal, and I found he was following that construction and its inventions and wonderful economies with great interest. The account of the French work which follows is prepared partly from the statement of the officers and partly from the various official and non-official publications on the subject.

The Suez Canal connecting the Mediterranean and the Red Sea is 99.2 miles long, has no locks, and is built through a flat, sandy country. For twelve miles it runs through lakes; for the rest of the way it is excavated. The two seas are practically at the same level, the Red Sea being only six inches higher at a mean level. De Lesseps, then an unknown engineer, obtained a concession to build the canal from the Khedive of Egypt in 1854, and formed a private company in France. The estimates of cost were forty million dollars. The subscription lists were opened in Paris, November 30, 1858, and the stock was soon all subscribed, the people of France, chiefly, taking one half, and the Khedive of Egypt the other half. The capital was four hundred thousand shares of five hundred francs each, and no bonds were to be issued. The excavation was eighty million cubic yards, all earth, no rock, except a little gypsum, which the steam-shovels excavated. The digging was done partly by men and partly by ma-



NICARAGUAN KITCHEN.

chinery. The Khedive agreed to furnish all the labor, 25,000 to 30,000 men. Work began in 1860. It was a healthy country, but very hot, 94° being the mean summer temperature at Ismalia, the half-way port, and 120° in the shade not uncommon. The work was done on the American plan of as cheap construction as possible until some income could be had, and gradual improvement in capacity and finish as business and earnings justified it. The canal was made only twenty-six feet deep. At the Mediterranean end, where conditions of sand and winds somewhat similar to those at Greytown prevailed, a good harbor was easily made by building two breakwaters out to deep water and afterwards dredging out the sand between them. These were of concrete blocks, piled irregularly, the French being very favorable to concrete, and probably the leading experts in its use. The eastern breakwater is 6,020 feet long, and the western 6,940 feet. Some sand has occasionally worked into the channel in severe storms, but no difficulty has been experienced in keeping this harbor channel clear by some slight dredging. The total dredging needed in 1894 was only 49,188 cubic yards.

The canal was opened in 1869. The traffic increased steadily every year, and by 1886 the business was so large and the delays so great that it was decided to increase the capacity. It was widened, and deepened to twenty-eight feet, at a cost of twenty-four million dollars.

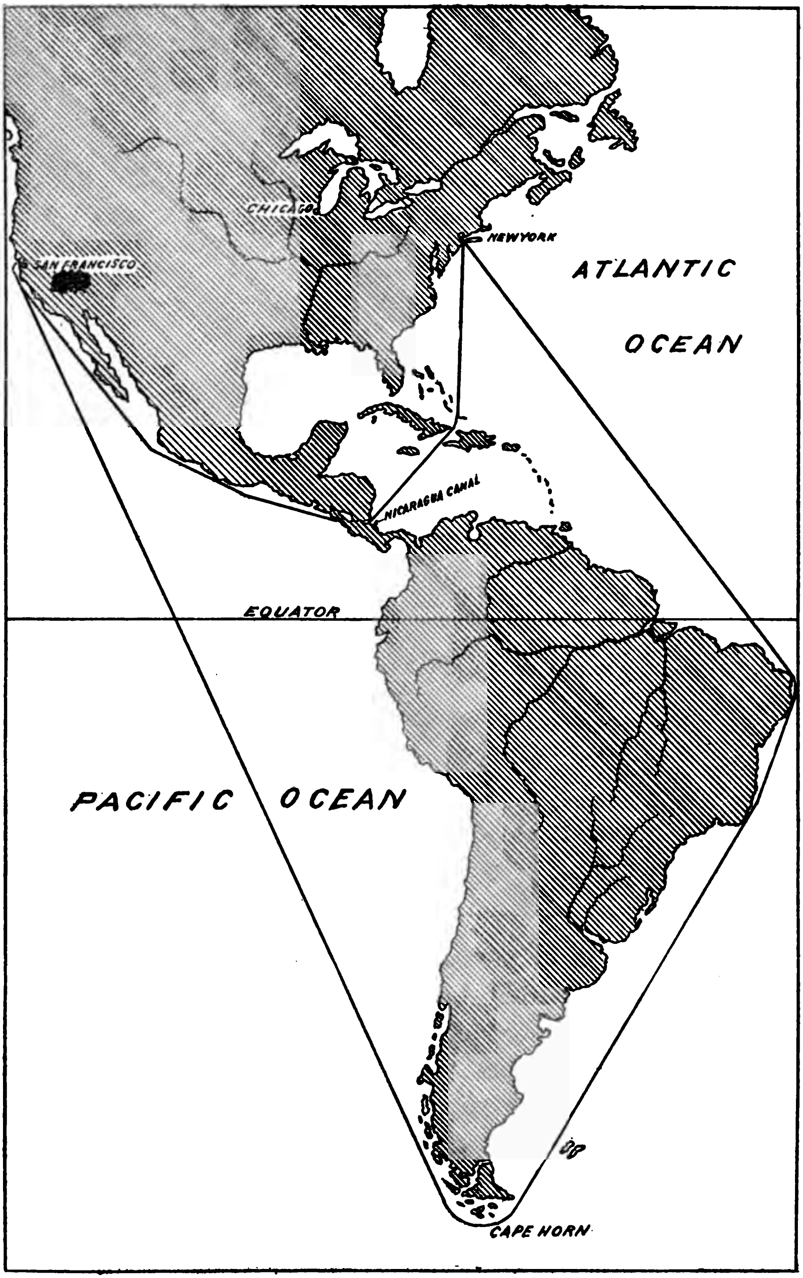
The financing was of exceptional interest. The Khedive who had granted the concession died, and his successor refused to proceed with the contract and furnish more labor. The Emperor of the French, Napoleon III., assessed the damages. In July, 1864, he published his award, condemning the Khedive to pay the company, for breach of contract, sixteen million eight hundred thousand dollars,—an extraordinary assessment, but France was able to compel its payment. When it was found, in 1867, that the stock was insufficient, bonds for twenty million dollars, running fifty years, bearing five per cent interest, were issued. They were offered and sold at sixty. This, with the stock, imperial award, and bonds, amounted to seventy-six million eight hundred thousand dollars. There were also some other sums paid by the Khedive. The officials state the cost up to December 31, 1869, the year it was opened, at $89,673,286. A floating debt was carried, supplemental bonds issued, and various other expedients resorted to, so that the first years of operation were under considerable financial strain. As earnings increased, and it began to become manifest that the canal would produce a large revenue, its credit improved, and its shares rose. The Comptoir National d'Escompte de Paris states, in a letter to me, that on May 3, 1895, the 500 francs shares were quoted on the Paris Bourse at 3,390 francs.

The English government had been closely watching the French occupation of Egyptian territory under this concession. In 1875 the Khedive had need of money, and the English government, under Lord Beaconsfield, thereupon purchased his stock in the canal. They bought 176,602 shares of the total issue of 400,000 shares, paying about $20,000,000, being about 566 francs for each share of 500 francs. The purchase has proved extremely profitable, and was followed, in 1882, by British occupation of Egypt, which is continued to this day.

The table of the business of this canal shows that the average size of the vessels passing through it has gradually increased, and also that reduction of tolls has added to its business. The average tonnage of ships passing in 1892 was 2,166 tons; in 1893, 2,292 tons; in 1894, 2,398 tons; and in 1895, 2,460 tons.

YEAR.	NUMBER OF VESSELS.	NET TONNAGE.	RECEIPTS FROM TOLLS.	AVERAGE TOLL.
1870	486	436,609	$869,152	$1 99
1871	765	761,467	1,519,077	1 99
1872	1,082	1,160,743	2,875,418	2 47
1873	1,173	1,367,767	4,170,145	3 04
1874	1,264	1,631,650	4,533,558	2 77
1875	1,494	2,009,984	5,286,158	2 64
1876	1,457	2,096,771	5,526,292	2 63
1877	1,663	2,355,447	6,036,186	2 57
1878	1,593	2,269,678	5,669,134	2 49
1879	1,477	2,263,332	5,426,223	2 39
1880	2,026	3,057,421	7,298,524	2 43
1881	2,727	4,136,779	9,438,776	2 28
1882	3,198	5,074,808	11,086,208	2 18
1883	3,307	5,775,861	12,111,698	2 09
1884	3,284	5,871,500	11,725,752	2 00
1885	3,624	6,335,752	12,011,452	1 89
1886	3,100	5,767,655	10,954,215	1 89
1887	3,137	5,903,024	11,199,060	1 89
1888	3,440	6,640,834	12,607,524	1 89
1889	3,425	6,783,187	12,882,502	1 90
1890	3,389	6,890,094	13,085,446	1 89
1891	4,207	8,698,777	16,308,167	1 87
1892	3,559	7,712,028	14,522,662	1 88
1893	3,341	7,659,059	13,772,592	1 80
1894	3,352	8,039,175	14,423,393	1 79
1895	3,434	8,448,383	15,186,871	1 77

The chief saving of distance is in the English trade with India and China. Between London and Calcutta 3,626 miles is saved, and between London and Canton, 3,300 miles. The average saving is about 3,500 miles. The average saving of the Nicaragua Canal will be somewhere between 5,000 and 8,000 miles.



MAP SHOWING DISTANCE SAVED BY NICARAGUA CANAL.

South America extends about 1,600 miles farther south than Africa. It is nearer from Liverpool to San Francisco around Cape Horn by the usual course of a sailing-vessel, which is 14,690 miles, than from New York to San Francisco, which is 14,840 miles. South America is not situated due south of North America, the continental lines not running with the meridian. The most easterly point of South America, which is Cape Saint Roque, in Brazil, lies about 2,656 miles east of New York, and vessels bound from New York to the Pacific coast must first sail 2,656 miles to the east in order to pass around Brazil. San Francisco is by no means exactly north of Cape Horn. It is north, but it is also about 3,808 miles west. This easterly bearing of the continent of South America is one of the reasons why the New York and San Francisco voyage will be so much shortened by the Nicaragua Canal.

The chief objection offered when money was asked to construct the Suez Canal was the drifting sands. The winds sweep across a dry, level country, and carry great quantities of sand into the canal. Constant dredging is as necessary to-day as ever to keep it clear for vessels, and should this dredging ever be stopped, the canal would soon be obliterated in places by the forces of nature. The question was, Would the earnings sufficiently compensate for the necessary continuous dredging? It has proved that they are more than ample. The necessary dredging in the canal itself, not including the two harbors, was 846,117 cubic yards in 1894 and 1,009,380 cubic yards in 1895.

There was offered, also, an objection based on the contrary winds prevailing in the Red Sea. This has proved well founded, and many sailing-vessels, because of these Red Sea winds, follow the Cape of Good Hope route in preference to that through the Suez Canal. The tide in the Red Sea rises five to six feet and thus causes a small current in the canal. Vessel-commanders regard this current in their choice of hours. The usual draft of the world's chief commerce is shown by the fact that 1,250 of the 3,434 vessels passing in 1895 drew *more than* $22\frac{9}{10}$ *feet.* Should the engineer department of the United States army be called on to prepare the plans and specifications for the Nicaragua Canal, as provided in the bill which passed the Senate, it would be wise to detail two or three officers to make an early examination of the construction and practical operation of the Suez Canal.

The annual balance-sheet and report presented to the stockholders at the annual meeting in Paris, June 2, 1896, are extremely interesting. The gross receipts for the year ended Dec. 31, 1895, were $16,140,557, the French expedition to Madagascar and the transportation of troops to Abyssinia having contributed largely to increased earnings, as compared with those for 1894, which were $15,390,231. The cost of administration and operation in 1895 was $1,203,011, and the cost of maintenance was $696,664. After paying these and the bond interest, the net earnings were $8,393,803, which were appropriated as follows:

71 per cent to the stockholders	$5,959,600
15 per cent to the Egyptian government	1,259,070
(This was provided in the concession.)	
10 per cent to the founders of the company	839,380
2 per cent to the officers	167,876
2 per cent to the employees	167,876

The last two items are in accordance with methods of administration occasionally pursued by the French, of paying fixed salaries and wages to the officers and employees and stimulating them all to greater effort and faithfulness by a small interest in the profits of the year. There are some marked virtues in this practice.

The family of Count de Lesseps was given the customary annual pension of $24,000 out of the year's earnings. Three per cent of the net earnings, being $259,602, was passed to the reserve fund, which then amounted to

$1,410,533. The year having been exceptionally prosperous, the sum of $301,575 was laid aside for future repairs on the canal. The dividend is more than 74 francs (74.495) per 500 francs share, or nearly 15 per cent, as against a dividend a little in excess of 14 per cent in 1895.

The capital account is as follows:

Ordinary shares	$40,000,000
Dividend certificates (issued in place of dividends during construction)	6,800,000
Bond issue of 1867–1868	19,999,980
Bond issue of 1871	2,400,000
Bond issue of 1880	5,399,992
Bond issue of 1887	17,248,453
Other funds applied to construction or betterment	30,211,328
Total cost	$122,059,753

The last item includes the damages assessed by Napoleon III. against the Khedive of Egypt,—*la sentence imperiale*, as they call it,—and some other payments by the Khedive, amounting in all to about $24,000,000. During 1895, 3,434 vessels passed through the canal. It seems strange at first, but is explained by the climate, that 95.1 per cent made the passage by night, the electric light being now used. The percentage of night use was 94.9 per cent in 1894 and 92.2 per cent in 1893. The passengers carried on the passing ships in 1895 were 216,938.

The average time required to pass through in 1895 was 19 hours 18 minutes, of which the average time of being actually in motion was 16 hours 48 minutes, a decrease of 37 minutes as compared with 1894, and of 86 minutes as compared with 1893.

The canal is now being enlarged again. The outlay on this account during 1895 was $781,837, which was met out of the proceeds of additional sales of bonds. This French board appears to have watched more carefully than we do the idle cash on hand, having been careful to have it always earning some interest. They have, too, better facilities for making short loans, so that the earnings on temporary investments during the year were $224,986.

Of the 3,434 vessels which passed during 1895 only five carried the American flag.

Chief Engineer Vieussa showed me some of their photographs, of which there are twenty large volumes. I note, for the use of our own engineers, that they were taken by Arnoux, Port Said, Egypt, and copies could no doubt be obtained from him. These photographs give an excellent idea of how the work has been done, especially the construction of the two harbors. M. Vieussa says that the average cost of excavating a cubic yard of sand by dredging at the present time is eighteen cents.

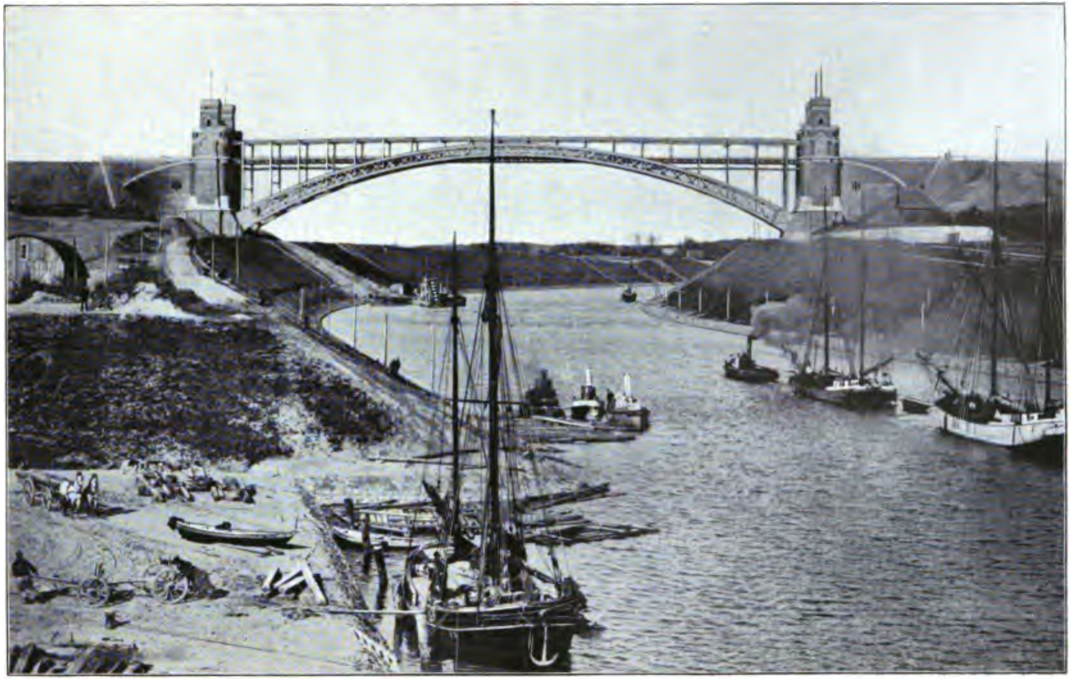
In new construction it was from thirty to forty-five cents. He recommends for use in Nicaragua their present dredge, with revolving buckets, which he considers the best in existence. It is of French invention and is made in France. He said that they had no electric-lighting of the canal (it has since been adopted), but used the Pintsch system of compressed gas in buoys, one charging of the buoys serving for two or three months. The ship-captains prefer to pass by night, because it is cooler, and also because the channel is more easily seen by means of the lighted buoys. In that hot climate there are waves of heat in the air by day, and it is therefore more difficult for the eye to discern accurately the channel-marks and buoys. No accident has ever yet occurred by reason of the night service. They insure to all ships 25.591 feet (7 mètres 80 centimètres) of water. They actually have 27.887 feet (8 mètres 50 centimètres).

We next spoke of the plan, followed by his company, of great economy in construction until business warranted more costly construction, as compared with the plan followed in constructing the Manchester Canal. He said that in Nicaragua the work needed for the future could probably be done more cheaply while the canal is being constructed, yet the interest on the cost of all construction not needed during the early years of use would be lost. He strongly recommended providing at first for immediate needs only, and made use of the phrase, "It will be judicious." The profession of civil-engineering has a very pleasant sort of comradeship about it, the leading men in all parts of the world knowing and following up the work in which others are engaged, though in different nations and speaking different languages. Chief Engineer Vieussa sent a very pleasant message of thanks, and of appreciation of his work, to the chief engineer of the Chicago Drainage Canal.

NORTH SEA-BALTIC CANAL.

This canal was opened in June, 1895. Our ambassador to England, Mr. Thomas F. Bayard, had attended the ceremonies of the opening, and when giving me some introductions through which I was enabled to examine the canal, summed up the work most concisely by comparing it with the conditions in Nicaragua. After speaking at length, and most favorably, of the proposal for a canal in Nicaragua, he remarked that at Kiel there had been no company formed, the German government itself taking charge of all construction, employing eight thousand men, devoting eight years to the work, and paying for it as it proceeded. The canal was at home, on their own ground, even on historic ground, for battles had actually been fought on parts of its line. Not only was the topography familiar, but even the geology was of every-day knowledge—the soil, the strata, and all the formations. The laborers worked, too, in their own climate—no tropical climate to be considered—and there was no expense nor hazard for long transportation of men and machinery. Then the government was a monarchy, with one head in control of everything, and the nation was essentially military. Every economy that rigid administration could devise was practiced, and finally, all work was done absolutely without corruption, with rigid honesty. It should be noted, he said, how exceptionally favorable were all the conditions of construction.

This canal extends from Kiel on the Baltic to the mouth of the Elbe on the North Sea. It is 61.3 miles in length and has a nominal depth of 29 feet. The cost was about forty million dollars. A very interesting point in the finances is that the cost has not exceeded the estimates which were laid before the Reichstag at the outset. The work was begun in 1887. The Germans went at the matter with characteristic thoroughgoing method. They first created a canal commission in July,



THE NORTH SEA-BALTIC CANAL.

1886, placing at its head Engineers Loewe and Fülscher, two of their best men. More than fifty able engineers and architects were assigned to the commission, most of them being already in the government employ. When the commission had completed the plans, the undertaking was laid out in five sections, and the head of each section let the work out by contract. The bidding for the contracts was sharp. The excavation, foundation, and masonry work were allotted to ten contractors. The commission retained control of the houses and food for the laborers and all medical supervision. German administration is excellent, and when the Nicaragua construction actually begins, the officials in charge of it cannot do better than to look carefully into the system adopted for the management of labor, inspection of work, and payment of contractors followed by the commission at Kiel.

On arriving at Kiel in July, 1895, a month after the opening ceremonies, I met Chief Engineer Fülscher. He has been stationed at Kiel during the whole construction, Chief Engineer Loewe remaining in Berlin. I found Herr Fülscher greatly interested in the proposed Nicaragua Canal, and quite ready to hear at any time that our government had decided to secure its immediate construction.

He seemed to look upon the work as entirely feasible. A striking thing about the opinions of all officials and distinguished engineers abroad is the force with which they feel that it is the duty of the United States to construct a canal in Nicaragua, in the general interest of civilization. Herr Fülscher not only knew of the cheapening of construction shown on the Chicago Drainage Canal, but he had actually gone to Chicago two years before, to examine personally the new methods of work pursued there. He had also visited, at the same time, the work on the Sault Ste. Marie Canal at Lake Superior.

Herr Fülscher said that their earth-excavation had cost sixteen cents per cubic yard. They had no rock work. As to wages, engineers of dredges had been paid $1.50 a day, masons $1.50, and laborers $1. They have only two locks, one set at each end, built to counteract the tidal changes.

A noticeable thing in all their construction is the spirit of economy shown. The canal work is substantial, but it is not built as if intended to last for centuries without repairs. The approaches to the first lock from Kiel harbor are of creosoted timber instead of masonry. Contrasting the locks with those in the Manchester Ship-Canal it would be noted that the masonry at Kiel was much lighter.

The lock-gates were about half the weight of the English ones. The first bridge, a wagon-road, was a pontoon. It had steel tanks, a plank roadway, and half of it could be swung to one side. It was of the cheapest construction. There are electric lights all the way, a line on each side, the lamps two hundred and seventy feet apart. The poles for the wires are of wood, and very short. The iron bracket on each pole for the lamp, extending three feet, is of the simplest character, and the poles of the telegraph and telephone lines were unpainted, like those along any of our Western railroads. The railroad bridge at Levensau is twenty-seven feet wide, a track on one side, a carriageway on the other, and no division barriers. Both were on a wooden flooring. The suspension towers were of stone, up to the railroad, but from that point they were of brick. Had the canal been built by a company, the many evident economies would have greatly pleased a stockholder.

The canal was a war measure, to enable the German fleet to be quickly moved from the Baltic to the North Sea. It was a question of increasing the navy or constructing the canal, and Moltke's advice was, "Put the money into ships." A German naval officer told me it was a question of men, and the canal was chosen because the German fleet had already absorbed all their seafaring men who could be spared from the merchant service, and their experience had been that ordinary landsmen never made satisfactory sailors. The canal is open to the commerce of all nations, but I was told by the same authority that the earnings from its use, by vessels of commerce, are not likely, at least for some years, to pay more than the ordinary expenses of maintenance. The *Nautical Magazine*, London, July, 1895, computes the canal charges for a vessel of 1,000 tons at $130, the saving in time 36 hours, the saving in expenses and coal $140, the total gain being only $10. In winter the canal charges are 25 per cent higher, and instead of a gain of $10, using the canal would involve a loss of $45. Its conclusion is, that the canal will not be very largely used by vessels of commerce.

Every great enterprise encounters some obstacles, and while the engineering department of the Kiel Canal had only strong praise for their undertaking, yet naval officers say that the banks of the canal, which in many places are quite high, exert such a pressure on the sand-beds through which the canal has been cut as to cause the sand to keep constantly boiling up into the bed of the canal. The chief trouble now is to maintain depth. A few years ago, when arranging the construction of a sea-wall about a mile in length, on a sandy shore exposed to destructive storms, and conferring frequently with the engineers over the plans,—discussing all those matters of relative strength and cost which usually arise between the men who prepare plans and the men who are to pay for the construction,—the authorities proposed to fill in behind the wall with sand dredged from the bottom in front. This plan was abandoned after some discussions, when it was stated from what great distances sand much below the surface will slowly flow toward any new excavation; and in looking over the ground where the North Sea-Baltic Canal is cut, I could readily see how much annoyance and expense the constant inward flow of sand might cause. The hope of the authorities is that this flow will grow less as time goes on.

MANCHESTER SHIP-CANAL.

The city of Manchester is only a short distance inland, Liverpool being its port, and its railroad connection with the sea is good; but it wished to be itself a port, and a canal has been built to the sea, 35½ miles long, 26 feet deep, and costing seventy-five million dollars. Manchester is 70 feet above mean tide-level, and this is overcome by four locks, most elaborate structures. I saw the canal in July,

1895. The undertaking is of great interest, in connection with a canal in Nicaragua, in two respects. It illustrates how persistence will overcome the greatest opposition to construction, and also what mistaken financing it is to build too elaborately at the outset.

The country traversed is thickly settled. The railroads were averse to the competition of such a canal, and the city of Liverpool, with all its wealthy dock and warehouse companies, did not wish any inland port to be established. Under the English laws any new railroad or canal company must first secure permission from Parliament. The bill is referred to a committee, who hear the testimony of experts as to whether the undertaking is needed, and if so, whether the plans are good. Application was made to Parliament in 1882, and after a long struggle permission was refused. A new attempt was made at the next session. A Liverpool dock company sent for our American engineer, James B. Eads, who had successfully dealt with the mouth of the Mississippi, to appear as an expert against the bill. Captain Eads has the reputation of being the man who again defeated it. He did not like the plans for the approach to the sea, where the tides are high. His fee for services as expert is said to have been twenty thousand dollars, an unprecedented payment for testimony as an engineer. The bill was again thrown out. The plans were then modified so as to bring them more in line with the views expressed by Captain Eads, and a new bill was introduced in 1885. These modified plans have been substantially carried out, and it should be added that there is now a feeling that Captain Eads did the undertaking an actual service in bringing about the changes he suggested. There was a struggle for thirty days before the House of Commons committee, and thirty-five days before the House of Lords committee, but the bill finally passed, in spite of all opposition, August 6, 1885. The Parliamentary expenses now shown on the canal company's balance-sheet are over $750,000. It is said that the expenses of the opposition were $1,000,000, so that, in all, the outlays for only permission to construct came to more than $1,750,000.

Next came the financial struggle, which was also severe. The great house of Rothschild took up the matter, and issued a prospectus for the stock, July 20, 1886. The subscription was a total failure. The public would not invest. The city of Manchester then came forward, reporting favorably on the question of revenue, November 26, 1886, whereupon the Rothschilds and the Barings again submitted the proposal to the public for subscriptions, and this time all the stock was taken. June 8, 1887, the whole work was let to one contractor, Thomas A. Walker, for $28,750,000, to be completed in four years. November 25, 1889, Mr. Walker died, and his executors went on with the work for one year. The company then acquired all his plant, valued at five million dollars, and the work was completed partly by the company and partly by contract. First-mortgage debentures were issued for $9,035,000, and later, second-mortgage debentures for $3,000,000, both at four per cent. In July, 1891, the funds being exhausted, the city of Manchester, to secure completion, advanced the company $7,500,000, the city being granted five directors on the board, and its own consulting-engineer. In March, 1892, the city was obliged to advance the company $7,500,000 additional. This proving inadequate, and the city being then in a position where it could not afford to see the project fail, it advanced to the company, in June, 1893, another $7,500,000. Subsequently $2,500,000 more was advanced, the city's money in the canal being now $25,000,000. The interest paid to the city is four and a half per cent.

There were other drawbacks. It became necessary to purchase outright the Bridge-

WASHING CLOTHES, NEAR LAKE NICARAGUA.

water Canals, an old system for small boats, nearly parallel, and this cost $8,500,000. The railroad companies crossing the line demanded fixed bridges, and to obtain the necessary height,—seventy-five feet clear,—it was obligatory to construct, not only the bridges, but also the approaches,—earthen embankments sometimes extending back three quarters of a mile on each side. A disastrous flood came in 1890, destroying much unfinished work. The land-purchases proved unexpectedly high,—five million dollars,—and the interest paid on stock and bonds during construction exceeded five million dollars.

The balance-sheet is the best account of all these great enterprises. The canal was opened January 1, 1894. The report of directors for the half-year ended December 31, 1894, is as follows:

CAPITAL.

Ordinary shares	$20,000,000
Preference shares, 5 per cent	20,000,000
Raised by loans at 4 per cent	12,035,000
Raised by loans at 4½ per cent	25,000,000
	77,035,000
Less calls on shares in arrears	13,385
	$77,021,615

EXPENDITURES.

Construction of works	$49,529,480
Bridgewater Canals	8,925,705
Land (purchase and compensation)	6,374,955
Engineering and surveying	729,320
Interest on share and loan capital	5,853,665
Parliamentary expenses	829,565
General expenses	1,924,180
Balance	2,854,745
	$77,021,615

The revenue account is as follows:

SHIP-CANAL.

Tolls, etc	$267,965
Traffic expenses, taxes, etc	212,975
Net revenue	$54,990

BRIDGEWATER CANALS.

Tolls, etc	$750,475
Traffic expenses, taxes, etc	621,115
Net revenue	129,360
Total net revenue	$184,350

This is not a very good showing for the last half of the first year. Dividends on stock are out of the question, and unless the situation greatly change, it is not easy to see how the interest on the loans is to be paid. This interest amounts to $1,605,000 per annum. The city of Manchester issued its bonds to raise the money. It is an extremely well-governed city, of about five hundred thousand population, overflowing with municipal improvements of all kinds, with a correspondingly heavy tax rate, and if the canal is to be unable to pay its interest charges, there will be a heavy burden on the tax-payers.

One cannot but deplore the position of the shareholders. There was a strong local pride. It was said that the canal would be very profitable, and people of small means in and about Manchester subscribed for shares. Much of this stock is now held by people in cottages, mechanics, and even cabmen. Some of the waiters in the hotel where I stopped were shareholders. The Manchester Stock Exchange List of July 25, 1895, quoted the preference shares, which cost $50 each, at only $13, and the ordinary shares, which also cost $50, at only $10. The canal has three superb locks at its outlet, where one could do all the business for years, and there are intermediate locks, and side-sluices, finished in costly granite, like fortifications. The Salford docks have a water-space of 71 acres, and the Manchester docks 33½ acres, the area of the quays being 23 acres, and their length 1¾ miles,—all waiting for business to be developed. Even the houses for the lock-keepers are costly, two stories high, brick, with slate roofs, neatly fenced, with climbing vines and gardens. When one reflects on the burdens of the tax-payers of Manchester, the possible depreciation of all city real estate on account of the debt, and the misery of all the stockholders of moderate and small means, the forty million dollars of stock being now worth less than ten million dollars, it does seem that the sound principle for building works of this character is to be content with ordinary construction at first,—just enough for present needs,—and to enlarge the accommodation only when and as the revenues justify the cost.

The Manchester Canal, as an engineering matter, is a noble achievement, one of the very best illustrations of the engineering resources of the close of the century, and it was a great pleasure to meet the chief engineer, Leader Williams. He has been knighted by the Queen for his successful services, and is now Sir Leader Williams. He told me of De Lesseps, in one of the crises of Panama construction, visiting England to get his opinion on the new plans for a canal with locks. Nicaragua and the present canal company's plans he knew almost familiarly. He is now in great request in England as an engineering expert, and with the caution of an expert he declined to express any opinion on the present plans, but he said it was a subject in which he took a deep interest. He seemed clear that a canal in Nicaragua was entirely practicable as an engineering matter, the question being only of the best plans; and he exhibited the greatest sympathy with the American engineers who were trying to arrange the crossing. He did make one opinion very clear, namely, that constructing this canal was duty, that this duty rested somewhere, and that it was on the United States. Indeed he did not seem to contemplate at all that it would ever be done with English capital.

He spoke with pride of one of his successes at Manchester. He found that he was obliged somehow to carry the Bridgewater Canal across the ship-canal. The level of crossing could not be changed, as was done with the railroads, and he devised a swinging-tank bridge, the first ever known. The Bridgewater Canal crosses by a steel box, the ends of which can be closed. It is always swung full of water. There is headroom for small steamers, and when I passed under it, a canal-boat, drawn by one horse, was actually crossing immediately over us.

THE CHICAGO DRAINAGE CANAL.

Some mention of the Chicago Drainage Canal appears to be fitting, as it is the largest excavation undertaking now in progress anywhere, and also because it has demonstrated how cheaply canal-work can be done. It is designed to create an artificial flow from Lake

Michigan toward the southwest, into one of the tributaries of the Mississippi River. It is to cost, when completed, about thirty million dollars, and contains about forty million cubic yards of earth and rock excavation, as against fifty-five million cubic yards in Nicaragua, not including the harbors. The Nicaragua estimates made in 1885 are forty cents per cubic yard for earth-excavation, whereas on the Chicago work, owing to recent inventions, the average price now paid is only 28 9-10 cents, and this has proved entirely satisfactory to the contractors. The Nicaragua estimates for rock-excavation are $1.25 and $1.50 per cubic yard. The same work is now being done near Chicago, by the channeling-machines and cantilevers, for an average of 76 3-10 cents per cubic yard, and the contractors say they are making a good profit. The whole work is divided into contracts of about one mile each. The earlier rock-excavation was let at eighty cents, but the prices have been gradually falling, and August 29, 1894, the last contract was let at fifty-nine cents. This is a vast difference from the Nicaragua estimates of $1.50. Allowance, of course, must be made for the work in Nicaragua being done in a foreign country, but there is plainly a wide margin between the prices in Chicago and the Nicaragua estimates.

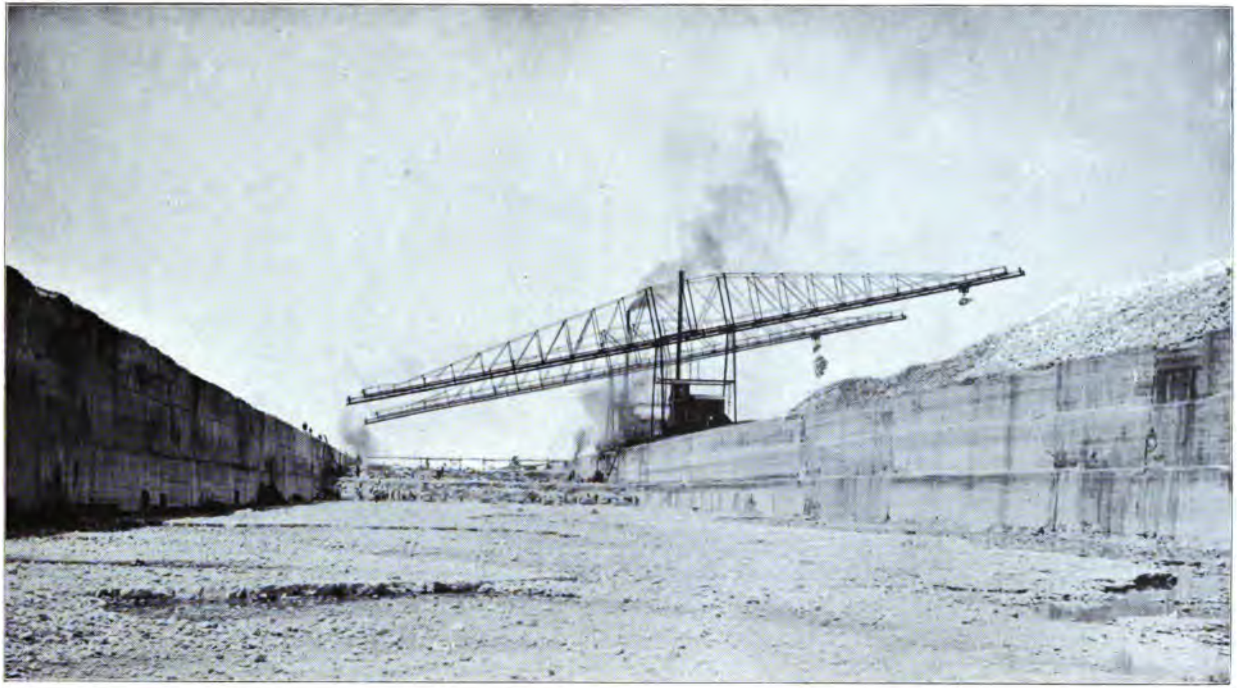
Each contractor uses such machinery as he thinks best. All have experimented with new devices for reducing the cost. On some sections cableways are in use; on others, the steel bucket, conveyor, cars on an incline, or the steel cantilever bridge. Each contractor has opportunity to observe and profit by the experiments and failures or successes of his associates. As often happens, opinions vary as to which devices have proved most satisfactory.

One of the novelties in earth-excavation is the hydraulic dredge, which has recently been brought to Chicago from the Pacific coast, and appears to be admirably adapted to all the Nicaragua harbor excavations. It cuts the submerged earth loose from the bottom, draws it into a large pipe and then pumps it through another pipe to the place of deposit. It will successfully carry earth to a place of deposit 3,000 feet from the dredge. Two of these dredges have moved 1,538,387 cubic yards in 882½ working-days,—an average of 1,731.9 cubic yards per day each. The contract price is thirty-one cents per cubic yard, but it is claimed that this is too high, and that the actual cost to the contractors, exclusive of interest on the plant, is only five cents per cubic yard.

The part of the canal through solid rock is 9 miles long, 160 feet wide, and an average of 33 feet deep, the sides being vertical. There is also six miles of cutting through earth underlaid by rock. By using the channeling-machines the sides of the rock cut are as clean and sharp as if cut by a saw, and the whole thirty-three feet is managed in three cuttings of eleven feet each, each cutting having an offset of six inches. Work has been in progress since September 3, 1892; and January 1, 1897, over ninety-two per cent of the undertaking had been completed. The whole work is to be completed in 1898. The cost is borne by the city of Chicago, including a small suburban tributary district. It is expected that the national government will ultimately improve the waterways below Joliet, so that in time this drainage-canal may be a portion of a ship-canal, by which vessels can pass from the Mississippi River to the Great Lakes.

In comparing the Chicago canal prices with the field of work in Nicaragua, I should add that I have been informed, on excellent authority, that rock-cutting is now being done in South America, on a considerable scale, by native labor, without the use of any machinery, at 60 cents per cubic yard.

The contractors on the Chicago Canal are eager about the plans for work under govern-



ROCK CUT ON THE CHICAGO DRAINAGE CANAL.

ment auspices on the Nicaragua Canal, and say that they are ready to enter into competition for both the earth and the rock excation just as soon as the plans and specifications are prepared. There is also another class of contractors who are well fitted to perform the work, namely, those who have aided in building the railroads in Mexico. They are acquainted with a warm climate, and they, as well as their chief subordinates, can speak Spanish.

CHAPTER VIII.

COST.

The present company estimates the total cost of the Nicaragua Canal at about seventy million dollars. In arriving at this amount a detailed table of all items has been made, and one fifth of the total has been added for contingencies. In 1889 the company itself selected an advisory board of five eminent engineers, and laid before them all its plans and estimates for an opinion. This board decided, after four months of examination, that the detailed cost should be placed at seventy-three million dollars, and that fourteen million dollars be allowed for contingencies, making the total estimate eighty-seven million dollars. It is to be noted that none of this advisory board is known to have ever had charge of construction in the tropics, and none of them visited Nicaragua to look over the ground.

The next estimate was made in 1895 by Mr. Colquhoun, the engineer sent out by the London *Times*. He names thirty million pounds (one hundred and fifty million dollars).

He is familiar with tropical work, and is inclined to emphasize the effects of a debilitating climate and the difficulty in obtaining labor. He does not appear, however, to have made any original computations, but rather to have taken the company's estimates, reviewed the excess of actual cost over estimates as shown at Suez, Panama, and Manchester, and then about doubled the company's estimates on general principles. This would not be sufficiently close work for capitalists contemplating any construction.

The government commission of 1895 made the next estimate. The appropriation at their command was only twenty thousand dollars, and with this inadequate sum for so large a subject, it was manifestly impossible to make independent surveys and original estimates. The commission consisted of an army engineer, a naval engineer, and a civil engineer, and they appear to have looked at the undertaking solely from an army and navy standpoint, and chiefly as a waterway for the ships of the United States navy, and with little consideration of the revenues which may be earned, or any of the purely financial or commercial sides of the question. There is force in their position, made quite prominent, that the size and draught of our men-of-war have a constant tendency to increase, and that special provision should be made for the use of the canal by our largest warships. This, however, is a matter to be discussed by the directors of the canal company, and perhaps decided by Congress, as provision for the largest warships afloat will greatly increase the cost as compared with provision for ordinary warships and the ordinary needs of commerce. Just here, that which the Suez Canal Company has found to be advisable should be considered. That company has worked this subject out carefully and has an established policy. This is one reason why it has earned such large profits. It can be said, in passing, that it believes that the largest ships require such costly additional accommodation, and bring such trifling increase in revenues, that it is not advantageous to provide for them. All it has heretofore assured to passing ships is 7 mètres 80 centimètres of water—25.591 feet. This it is now increasing. Of the 3,434 vessels which passed in 1895, only 228 drew between 24.63 feet and 25.59 feet. The North Sea-Baltic Canal is twenty-nine feet deep nominally, and the Manchester Canal is twenty-six feet. The present plans for Nicaragua are for a canal twenty-eight feet deep. The commission decided that it would be well to change the plans in several respects so as to give larger accommodation, widening many channels and all the locks. For this large canal, as well as for the increase in prices of construction, which they think should be allowed for, they estimate the cost at $133,000,000. The members of the commission were all without any experience in tropical construction.

As to the company's estimate of seventy million dollars it is to be noted:

1. It is a general rule in the business world, where any construction is to be done, never to buy bonds nor subscribe for stock on the estimates of the company's engineers or architects without first securing some independent estimates. In familiar construction in large cities the estimates may be tolerably correct, though my observation and experience are that there is very apt to be a floating debt at completion for unexpected cost, and in railroad-construction on unfamiliar ground, such as the Northern Pacific railroad, for example, some excess over estimates is almost universal.

2. The company's estimates were made in 1889, and allowance should be made for the vast reductions in almost all the material and work which improvements since then have made possible. All skilled labor will cost more than in the United States, the increased cost of such labor in railroad-building in

Mexico having been free transportation to that country, and I think about fifty per cent higher salaries. On the other hand, unskilled labor will cost much less than in this country. Provisioning the camps will cost about the same, medical care somewhat more, and fuel less, if wood be used, this being near and abundant, and in general use on the Nicaragua locomotives and steamers. On the Atlantic side there would be a slightly extra cost for coal, which could be had from Alabama, and there would be a considerable increase in cost on the Pacific side.

The fact appears to be that it is extremely difficult to make close estimates of any value. As a nation we have done so little work in foreign countries, and especially so little tropical work, that we have very few men who are well qualified to make a complete, detailed, safe estimate of the work to be performed in Nicaragua. Some experience in letting contracts or in executing similar work in hot countries is absolutely indispensable. There are a few men in the United States, engineers and contractors, who have already performed construction-work in Mexico, Central America, or South America, and who could give substantial and precise reasons for every dollar they might compute; and if some of these would consent to visit Nicaragua and examine the line and all the conditions, a very fair working estimate could be had. This would not be an estimate to be treated as a finality, but only as a working estimate, on the strength of which construction could be begun. There is no practicable way to assure this canal except to begin construction at once. Then let everything be saved that is possible by good management and frugality, and on the other hand make any additions to the estimates which experience proves necessary. It is too vital a matter for the extension of our trade and the movements of our navy in time of need, to let the question of its exact cost stand in the way of beginning the work.

REVENUES.

Opinions vary greatly as to the probable volume of traffic which will be conducted through the canal. It is generally conceded that two years after its opening will be required for commerce to adjust itself to the new route. The leading estimates of annual tonnage are as follows:

M. Levasseur estimated that the Panama Canal traffic by 1888 would be 7,250,000 tons.

The Nicaragua Canal Company claims that it will have 8,122,000 tons traffic.

Mr. Colquhoun thinks that two years after completion the Nicaragua Canal will have 7,000,000 tons traffic.

As the conditions are so similar, it is necessary, in taking a broad view of probable earnings, to consider the business transacted by the Suez Canal. The results there shown are more helpful than mere estimates: they are ascertained facts. That company deals with the world's commerce, just as will be done in Nicaragua.

In 1895 its business amounted to 8,440,000 tons. It had then been in operation twenty-five years. The first year, 1870, its business was only 436,000 tons; in 1871, 760,000 tons; in 1872, 1,100,000 tons, and there has been a fairly steady increase ever since, up to the amount in 1895. During all this time the volume of the world's commerce has steadily increased. Not only has trade more and more adjusted itself to the Suez route, but also the aggregate amount of trade has become much larger.

Some allowance should be made for the advantages possessed by the Suez Canal as a now well-established route. Taking its business eight years ago may be a fair offset for this item. The amount for 1888 exceeded six million tons. The earlier Suez tolls were $2.77 per ton, which have been gradually reduced to $1.77. Freight and passenger charges the world over have been greatly reduced the past twenty years, and traffic is not prepared now to stand heavy charges in any direction. A moderate tariff will be in every way desirable. A favorable, but approximate, estimate of the possible revenues in Nicaragua would be as follows: With tolls at $1.50 per ton at the outset, and a business of at least six million tons after the canal is fairly in operation, a gross income of nine million dollars would be obtained. Administration, maintenance, and operation for 1895 cost the Suez Canal about one million eight hundred thousand dollars. Taking into account all the dam and embankment work at Nicaragua, as well as the heavy rainfall, an allowance of three million dollars as an annual average for expenses may be fair, leaving a net income of six million dollars. An undertaking of this character is to be gone into only as a long-term investment, and the earnings for the first few years after it is completed are not to be considered as sufficient for a final judgment. The greatest earnings will come later on.

It is also to be noted that the Nicaragua Canal is likely to be used by sailing-vessels as well as steamers, which is not the case with the Suez Canal. Nicaragua is not in a region of calms. The natives travel along their Atlantic coast in sailboats, usually small schooners. Almost every evening some of these were leaving Bluefields for Greytown, and I found a number of them in the harbor of that seaport. I have elsewhere spoken of the steady force of the trade winds.

The business done by the Panama railroad might have been some guide to the probable business of the Nicaragua Canal; but besides the fact that ships are unable to get nearer to the wharves at Panama than two or three miles, this railroad, and the steamer lines from New York and San Francisco, passed early into the effectual control of the Central Pacific railroad, and all competitory business has been checked.

It is clear, and it should be emphasized, that all estimates of cost, business, revenue, and expenses are conjectural. It may become wise to enlarge the canal, and also to stimulate commerce by lessening the tolls, and also to help to build up the American carrying trade by specially low tolls, or even free passage, for American ships. Taking none of these measures into account, however, it seems reasonably clear that by the end of thirty years, when the bonds will mature, the canal earnings will have paid all maintenance and operating expenses, all interest on the bonds, and reasonable dividends, and besides this, will have made a substantial reduction of the bonds themselves.

In studying the subject of an isthmian canal, the engineering problems, the cost, the new diplomatic relations into which we will enter, and the great commerce standing ready to make use at once of the new crossing, I have been strongly impressed with a factor that scarcely appeared at first, and that is, the great stimulus such a canal will apply to commerce. It will create lines of communication which do not now exist at all,—opening the way for new trade of European nations with the Pacific, and leading our own country up to a commerce which is now unthought of,—a commerce which will come when the necessities of our hungry skilled workmen shall compel us to seek new markets for the manufactured goods which our own country cannot consume. These markets will be found not only along the western coasts of Central and South America, but also in Australia, China, and Japan. In railroad construction, the really first-class business men are those who can not only correctly estimate immediate earnings, but can also forecast such additional earnings as the development that must follow construction will bring about. In public life, the really great statesmen are those who can accurately foresee the effect of public measures on the distant future. It is long since our senators and representatives in Congress have had before them any question regarding which men of great ability and broad views have had such a field for legislation as they now have in guiding the course of our government, enabling it to appreciate correctly the great effects that this canal must exert on the increase of our commerce.

COALING-STATIONS.

One of the minor advantages and sources of income from the canal undertaking will be the establishment, by the company, of two large stations for the sale of coal to passing steamers,—one at Greytown, and the other at Brito. These will serve, chiefly, the needs of vessels passing through the canal, as it is a great economy in a long voyage not to be obliged to take on board, at the outset, sufficient coal for the entire run. On many steamers, too, the coal-bunkers have not the capacity for very extensive voyages. But vessels passing up and down the coast, on both the Atlantic and Pacific sides, will also be drawn to these points for fuel supplies. To our men-of-war these two coaling-stations will be of incalculable value. There are two such stations on the Suez Canal, and the sales of coal to passing steamers at the Port Said station in 1894 were nearly one million tons.*

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*The company, in correspondence, refers me to No. 1610, Diplomatic and Consular Reports on Trade and Finance, Egypt, Report of Mr. E. B. Gould, English consul, Port Said, 1894, which states the amount as 975,793 tons.

ENTRANCE TO CANAL—GREYTOWN.

The natural supply for the Nicaragua coaling-stations will come from West Virginia, Alabama, and other Southern coal-fields, all of which will be further aided by the canal in finding new markets in the countries bordering on the Pacific.

THE GOVERNMENT COMMISSION OF 1895.

The report of the United States commission of 1895 has been much misunderstood. It was appointed by the President, under a resolution of Congress passed March 2, 1895, to examine the canal company's plans and route, and to report on their feasibility, permanence, and cost. The members were Lieutenant-Colonel William Ludlow, corps of engineers, United States army; Mordecai T. Endicott, civil engineer, United States navy; and Alfred Noble, civil engineer.

The commission sailed from Mobile, May 7, and returned to New York, July 21, 1895. Careful study of the subject was then made, and a report prepared, dated October 31, 1895. These engineers take a military view of the whole matter, and proceed solely on the basis that it is desirable to have a strongly made canal, constructed to accommodate the largest American battle-ships afloat. They say that before adopting any final plans for the canal, they would like to see some additional surveys made for alternative routes. As to the present plans, they recommend various modifications, such as making embankments and dams stronger, channels wider and deeper, and harbors larger. This enlarged canal, they think, will cost $133,000,000. In a work of such extent special points may be easily overlooked; and the engineers think that new borings should be made where the foundations of dams, locks, and breakwaters are to be laid. They also think that the Ochoa dam might better be of masonry than of loose rock.

The report, which covers one hundred and three pages, shows great care; the calculations for loss of water by evaporation over the entire lake and river system, and the provisions proposed to counteract this, are an especially good piece of work. It is to be said of the report that it is a valuable contribution to the canal project, for it will unquestionably greatly aid the work of the corps of engineers of the United States army whenever they begin to prepare the final plans. All proposals for government aid have been made with the understanding that the United States army engineers are to make the plans for the canal, and all measures introduced in Congress expressly so provide. When those engineers have been directed by Congress to act, they will undoubtedly go over the whole subject most carefully. What the country wants now is, that Congress shall authorize the construction and make a beginning of the work at once.

In order to obtain the latest views of the commission, I wrote to the chairman, Lieutenant-Colonel Ludlow, and his reply, dated October 14, 1896, which he has given me leave to print, contains the following:

"For a brief statement from me as to the views actually held by the late government commission relative to the Nicaragua Canal, I should perhaps refer you for the best and most accurate information on this subject to the report submitted by the board to the President in November, 1895.

"This report, however, has not yet been published in its complete form, with the maps, profiles, appendices, and other data requisite for a satisfactory ascertainment of its contents, and as I infer from your letter that your purpose is to correct a mistaken impression that the canal was believed by the board to be an impracticable undertaking, I have no hesitation in saying that the report bears no such interpretation and expresses no such conclusion. On the contrary, the statement is explicitly made that the construction of a deep-water ship-canal across the Isthmus, via the

San Juan River and Lake Nicaragua, is entirely feasible, and at a cost fairly comparable with that of other undertakings of like magnitude and importance.

"This was the unanimous conclusion reached by the board, after a laborious personal investigation of the route and of the physics of the Isthmus for a period of three months, and a still more arduous examination, occupying three months more, of the company's engineering data in New York."

I also had a conference in July, 1896, with another member of the commission, Mr. Alfred Noble, and print his views with his permission. Mr. Noble stated that the commission was instructed to report solely on the engineering features of the canal, and not on its commercial aspects, and was careful to confine itself to those instructions. As to the present plans, he believed some changes should be made. Generally, however, as to a ship-canal in Nicaragua, he stated, with great clearness, as follows: "From the engineer's point of view the enterprise is entirely practicable. A canal can be built across Nicaragua, and, when completed, can be successfully maintained and operated. The formation of the country, owing to the large lake of Nicaragua, its outlet to the Atlantic by the San Juan River, and the low pass through the mountains there, between the lake and the Pacific, are very favorable to the construction of a ship-canal at that place. Later discussions have shown no reason for changing the view of the commission that the canal can be built, with sufficient capacity for vessels of the deepest draught now in use, at a cost of about $133,000,000. Speaking only for myself, I am free to say that if the United States shall wish to build a canal across Nicaragua, I regard the project as entirely practicable from an engineering standpoint, and think that when built on the best plan which can be prepared, and along the best route which can be selected, the canal can be operated entirely satisfactorily. Work in the tropics is not like similar work in this country, either as regards the manner of doing it or the cost, but men can be had who are able to take the contracts and carry them out, and suitable allowance can be made in the estimates for any increase in cost, which more complete surveys and excavations may show to be necessary."

A FOREIGN TRADE NEEDED.

The canal, when built, will promote the development of better markets for our manufactures in foreign countries bordering on the Pacific. These are less exposed than those on the Atlantic to European competition.

Our high tariffs, and consequent high wages, have brought to our shores an army of skilled workmen from abroad. Here they must stay, even though out of work. The panic of 1893, throwing such numbers out of employment, was a sharp reminder that our nation in its rapid growth has passed the point where America could always be depended on to absorb the output of all American factories. Many establishments are yet closed, or are working on half-time. This nation cannot be considered a first-class power when our people are only buyers from the rest of the world. Exporting agricultural products does not make a great nation. The French and the Germans do not engage in such exportation, finding other activities to be more profitable. A glance at the principal food-exporting countries shows the truth. They are such countries as southern Russia, India, and latterly the Argentine Republic, and they are poor, and they stay poor. We need to keep our wheat, feed our operatives with it, and send abroad the product they manufacture. The change cannot come suddenly, but we should plan and work for it. Some neglected markets are very near us. The Rio Grande is quite a small stream. One can ride a horse across it from Texas into Mexico most of the year. Crossing to Mexico and entering the first hotel, one finds an English cloth on the table in the dining-room. The cups and plates are English, the cutlery is from Germany, and the waiter wears a suit of German clothes. There probably will not be an article imported from the United States in the house, except a sewing-machine. The demand is there, but we have carelessly, almost good-naturedly, made no effort to sell.

We are, however, making some small beginnings of a foreign trade. On our steamer from Colon to New York, I met a German merchant of Guatemala, on his way to Germany to buy goods. He spoke of his house having recently taken a contract to equip the police force of Guatemala City, the capital, and I asked him where he purchased the materials. He replied, "We bought the revolvers in the United States. The best article is made there, and the price, too, is satisfactory. The belts we also bought there. We also bought there the waterproof cloaks. Formerly the English made the best waterproof clothing, but of late years the Americans have taken up the manufacture and have considerably improved on the English methods. Besides,—and this was very important for us,—their waterproofs, cloaks, mackintoshes, and the like, will bear the heat better. The cloth for the uniforms we bought in England, making it up ourselves in Guatemala City."

A merchant in Panama said they preferred to buy almost everything in the United States, as an order could be filled there so much quicker, but the American manufacturers did not seem to care for any foreign business, giving their orders scant attention, and especially packing the goods so insecurely that they often arrived in bad order. He asked me to go to the custom-house, saying that every American importation could be picked out at once by the poor packing. When I asked for the remedy, he replied that packing for a foreign trade was not to be learned in a day, and our shippers should bring men skilled in packing from Europe. Our own men would soon learn, after seeing how it should be done.

I take so great an interest in this subject of our building up a foreign trade, that a few notes are added, growing out of my own observations, on business with Spanish America.

1. Goods should be properly packed. At many ports everything is unloaded from the steamers into lighters, sometimes carelessly, and taken ashore often in the rain.

Most of the interior towns are reached only by trails, roads being rare. Mules carry all imports. How can an ordinary packing-box, three feet square, be carried on a mule? The Europeans place all such merchandise in long, flat cases, being careful that each case shall weight about one hundred and fifty pounds. Two such boxes make a load for a mule. Being long and flat, they are easily carried on his sides, where he is accustomed to a burden. In some of the western ports of South America, which will be made accessible to us by the canal, there is rain every day in the year, except, perhaps, three or four.

2. Our American houses should be represented by salesmen of middle age, of good address, and who can speak Spanish,—not American-Spanish. The active young man who is successful in Ohio or Colorado is unsuitable. In the Latin-American countries the salesman is not an employee. He is all of the house they ever see, and to them he is the house itself. The first day of his arrival he calls on his customers socially, and nothing is said about business. Often they ask him to call in the evening to meet their families. Many of the representatives of the European houses speak French as well as Spanish, carry evening dress, and wear it easily too, and know something of music, especially of the standard operas. All the social life of Spanish America moves continuously around music

and dancing, and the seller must meet the tastes of his customers.

3. The partners in our business houses should themselves occasionally visit the countries where they wish to do business, especially the senior partners. Most of all is this important for a trade they are just beginning. Once, when off the harbor of Tampico, Mexico, I asked a British merchant, a passenger on the steamer, how he came to speak Spanish so well. He replied that Spanish was always spoken in his father's house at breakfast. His grandfather had established a trade with Central and South America, and his father, inheriting the business, had trained his sons for the same work. The sons knew Spanish from infancy, and once a year, or oftener, one of the partners in the house visited the countries where their goods were sold. It is with trained merchants like these that we must compete.

Our people are preparing. One day, toward the close of his life, when I was consulting with Mr. James G. Blaine, in his library in Washington, on business connected with the State Department, the conversation turned to the extension of our foreign trade southward, and the famous advocate of more business with Latin America expressed great pleasure at learning that two thousand young people had that winter been studying Spanish in Chicago. The Pan-American conference had been much discussed, and they were early preparing themselves to be clerks, salesmen, stenographers, typewriters, and bookkeepers in our expected Spanish-American trade.

4. We must be prepared to give long credits. It is the custom, and all trade is based on this system. Most of the houses who will buy are responsible, failures being much more rare than with us.

5. Sell the people what they want. Our business men nearly always begin by trying to sell what they think the people ought to learn to use. That is slow work. Find what the people are accustomed to, and learn their tastes. Manufacture what they know and what they like. If a familiar article seems too heavy, or the colors in a print for the women's gowns too bright, never mind. Manufacture what they want. All European makers are particular to sell them what they like.

6. Trade follows friendship. Be civil to these people. More than that, try to think well of them. Overlook their faults. Dwell on their good qualities. They do not especially like the German goods, and they only half like the Germans themselves. A large business is done with England, but everywhere the preference of the people is to deal with

the United States. As the growth of England obliged its merchants to seek the trade of these countries, so our expansion should lead us to search for an outlet in the same manner. The Latin American countries lie in the most natural direction, within entirely practicable distance, and their people are disposed to the most friendly relations with us for the beginnings of our new foreign trade.

THE CLAYTON-BULWER TREATY.

It is often asked, Why should not the United States construct this canal directly instead of guaranteeing the bonds of a company? If our government should do so, it is possible that Great Britain might make a claim for joint control thereof under the Clayton-Bulwer treaty, which was entered into nearly a half-century ago. The eastern coast of Nicaragua, a dense forest, almost inaccessible from the interior, is inhabited by a tribe called the Mosquito Indians, Bluefields being their chief settlement. In 1688 the English governor of Jamaica established an informal protectorate over them. There was no commerce possible, and little was done beyond maintaining a British representative, called a resident, in Bluefields. After our war with Mexico, when we had obtained California, and had become a factor on the Pacific

OCEAN VIEW, NICARAGUA.

Ocean, it became apparent that we should need a route across the isthmus by which ships might reach our new possessions. Great Britain, seeing this, took possession of Greytown to control the San Juan River. Commodore Vanderbilt and his associates came forward with their proposal for a ship-canal across Nicaragua, to begin at Greytown, but to end in the Pacific, on the coast of the Bay of Fonseca, at the boundary line between Nicaragua and Honduras. Thereupon Great Britain sent a man-of-war and took possession of Tigre island, which was owned by Honduras, and situated in the Bay of Fonseca, near the mouth of the proposed canal, justifying the act on the ground of some indemnity alleged to be due and unpaid by Honduras. We should then have stood boldly by the Monroe Doctrine. It would have been substantially a parallel case if the United States had occupied both entrances to the Suez Canal as soon as that waterway was planned. Instead, however, of taking the action it ought to have taken, the administration of that day tried to compromise. Our Secretary of State was John M. Clayton of Delaware, and Great Britain sent Sir Henry Bulwer as a special envoy to Washington. A treaty was framed in 1850, whereby Great Britain and the United States agreed that neither nation should ever maintain for itself exclusive control over the canal. Whoever might construct it, both were to use it on equal terms, and the canal was to be neutral ground. Great Britain thereupon gave up possession of the two entrances. It is debated whether this treaty is still in force.

One clause stipulated that Great Britain should not extend her possessions in Central America, but after executing the treaty, she took possession of the Bay Islands. This action, it is maintained, ended the treaty. The general feeling among our public men seems to be that the best course is to consider the treaty no longer in force. There is a very different public sentiment existing in Great Britain to-day from that which prevailed in 1850,—one that is much more friendly to this country, and which will admit that the British occupation of Greytown and Tigre island was made without any payment of a purchase price to the governments whose territory was taken, and could not possibly confer any title the relinquishment of which could be the basis for a treaty with the United States. Should we construct the Nicaragua Canal, either directly as a nation or indirectly by guaranteeing the bonds of the builder company, we could not share its control with any European power. It will be for our interest to ask the commerce of all nations to make use of it, in order that it may have sufficient earnings, but its control, and the terms on which other nations may use it, will always rest with our government.*

Every friendly effort that the United States could make has been made to induce Great Britain to consent to a modification of this treaty. In 1857, President Buchanan proposed its abrogation, but without success. General Grant was most anxious to have a canal constructed under American control, and under his direction his Secretary of State, Mr. Hamilton Fish, asked Great Britain to do away with the treaty by agreement, and was refused. April 16, 1880, Congress, by joint resolution of both houses, requested the President to take immediate steps for the abrogation of the treaty. President Garfield came into power in 1881, and his Secretary of State, Mr. James G. Blaine, asked an abrogation of the treaty by consent, but was refused by Great Britain. President Arthur then took up the matter, and his Secretary of State, Mr. Frelinghuysen, again asked an abrogation, and was also refused. Thereupon President Arthur decided to proceed notwithstanding the treaty, and the Frelinghuysen-Zavala treaty was made with Nicaragua, providing for a canal to be constructed by the United States, and owned by them and Nicaragua jointly. Our Senate never having ratified this latter treaty, the whole subject remains still open.

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*A sketch of the circumstances under which the Clayton-Bulwer treaty was framed can be found in the article by Professor Keasbey, in Annals of the American Academy of Political and Social Science, January, 1896. The same author has discussed the subject more fully, going over the entire political history of isthmus transit, in an admirable work lately published, entitled The Nicaragua Canal and the Monroe Doctrine, by Lindley Miller Keasbey.

The Monroe Doctrine is the settled policy of the United States. It is a necessity for our welfare as a nation. With the increasing wealth and power of this country, both the application and the scope of this policy will find enlargement. It will be impossible for Great Britain to maintain the provisions of the Clayton-Bulwer treaty at this stage of the development of the United States.

THE COUNTRIES OF THE PACIFIC.

In building up a foreign trade, our natural course will be to begin with the countries where we shall meet least competition. In order to be profitable, trade requires to move along the lines of least resistance. Our geographical situation is such that we are the natural producers for all countries bordering on the Pacific Ocean. The relative distance of European manufacturers, as compared with our own, gives us a great advantage. The idea of trying to sell much of our products to China and Japan is new to our people; but those countries are entering on a career of great development, and why should not the American people have a share in supplying their wants? The trade reports tell the story of their awakening. The purchases of Japan from foreign countries, expressed in their silver, were:

In 1885	$28,000,000
In 1894	113,000,000

China bought from foreign countries:

In 1885	$132,000,000
In 1894	243,000,000

We have not been alive to this demand. Of Japan's purchases abroad of $113,000,000 in 1894, we sold her only $11,000,000. We excelled in paying money to her, however, for in that year we bought of her goods amounting to $43,000,000. Of China's purchases from other nations of $243,000,000 in 1894, we supplied only $10,000,000. We were good buyers, however, taking $25,000,000 of her products. Our diplomatic agents report that with more alertness and enterprise we could have furnished to Japan, and at a reasonable profit, sixty per cent of all her foreign purchases in 1894.*

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* Hon. John Barrett, United States minister to Siam. Article in *North American Review*, March, 1896.

One reason why the people of our Gulf states are so unanimous for a canal in Nicaragua is that it will open an additional market for their cotton. The United States is the chief producer of the world's cotton, and prices for this product have been deplorably low of late years, entailing great privations in many Southern homes. It is the old story. We have been producing more cotton than we could find markets for. The new buyer of cotton is Japan. That country is going strongly into the manufacture of cotton goods, such as are used by the people of the warm countries, and now not only exports these goods to China, but undersells the English manufacturers in their own dependency of India. It is impossible for the latter to sell the Manchester goods in Calcutta and Bombay as cheap as those now brought from Japan. The Japanese legation in Washington writes me that in 1894 their country purchased from other nations 142,000,000 pounds of cotton, costing $9,550,000. Of this only 14,000,000 pounds, costing $1,340,000 was bought in the United States. The remainder came chiefly from British India and China. We are told, too, that the Japanese mill-owners much prefer the cotton from the United States, if it were to be had at the same price, our cotton being cleaner and with a better fiber.

Its cost in Japan is, however, against it, owing to the freight rates made necessary by the long journey around Cape Horn. The saving of distance by a Nicaraguan canal from New Orleans to Yokohama will be almost one half. Since the close of the war our Southern states have had a period of great adversity to pass through, and the Southern people have borne themselves in a most manful manner, exhibiting both industry and enterprise. If the Nicaragua Canal, by cheapening all freight rates to Asia, will assist them to another important and growing market for their cotton, which now suffers so much from overproduction, it will be a most gratifying consequence of the undertaking.

The Southern states have taken the first step from a merely agricultural to a more profitable career. They are beginning to manufacture their cotton, and export the product of their mills, instead of merely raising and exporting cotton. Georgia has now 63 cotton-mills, having 623,098 spindles. North Carolina has 139 such mills, with 713,398 spindles. The chief cotton-manufacturing state, however, is South Carolina. Its mills are only 57 in number, but they are of a larger class, and have 804,227 spindles. Altogether, at the close of 1896 there were 352 cotton-mills, with 2,770,284 spindles, in operation throughout the Southern states. The product is chiefly the coarser grades of cotton fabrics, yet finer grades will be made every year; and this new industry has now reached a point where markets for its products must be sought, and any measure toward extending our commerce, such as the Nicaragua Canal, becomes a matter of grave interest.

CHAPTER IX.

NICARAGUAN CITIES.

After an examination of the country where the canal is to cross from the lake to the Pacific, I visited the capital of Nicaragua, going first to the city of Granada. The nights being cool, and the season that of the full moon, I had decided to travel as little as possible by day. I found, also, that the owners of the horses to be hired rather preferred night-travel, as being easier for their animals. My room at the hotel in Rivas had two doors, one opening on the courtyard and the other on the street. At half-past two in the morning, the guide, whom an acquaintance had engaged for me, rapped at the street door. I looked out, and saw in the bright moonlight the guide and his brother, who had come to assist, their two horses, a horse for myself, and a mule for my baggage. While the two men were packing this on the mule, I dressed and had some of the cold coffee and eggs which had been placed on my table the night before. After the men had taken coffee also, of which they seemed very glad, and cigarettes, we started through the silent streets of Rivas, out into the country, past chocolate plantations, along the Granada road. My mount was excellent, a small, well-bred horse, with fine ears and coat, and a comfortable Mexican saddle. In an hour or more we came to the house where the guide and his brother lived. The wife of one was watching for us, and the brother, who was to leave us here, cut from the garden some fresh oranges to be carried in the guide's saddle-bags, for my use on the journey when the air should grow warmer. As we resumed the road, I chatted with the guide for a few miles, and then rode on in advance, leaving him to lead the baggage-mule. I passed through some small villages whose inhabitants were almost all sleeping, and about sunrise crossed a small river. About seven o'clock I rode up to a fair-sized ranch-house, standing back from the road a little distance, and asked for coffee, which was soon made, and was capital. Much of the road was through forest. About ten o'clock I came to another river, which I knew must be the Ochomogo. Close by was a very comfortable ranch-house, where I arranged for breakfast, and, while it was being prepared, went down to the river for a bath. There is always an ample open space before country houses in Nicaragua, a sort of verandah, only

A VILLAGE STREET.

it is all under the main roof, and there the table is spread for meals, and hammocks are swung. After breakfast I went to sleep in a roomy hammock, and about four o'clock, when the heat of the day was over, we resumed our journey. Just at dark the town of Nandine was reached. After telegraphing to Granada for hotel accommodation, having supper, and taking a short walk about the town, I went to my room. The hotel was a very quaint structure, spacious, of one story, and having a cock-pit in the central courtyard, with seats for spectators. Game cocks were tied up by one leg all around the inner verandah, and it was difficult to go about in the dusk without stepping on one. My guide was provided with a cot instead of a room, and placed it on the inner verandah, at my door, depositing by it the natty red-and-white striped, thin blanket he had carried all day strapped above his saddle-bags. His preparations for the night were exceedingly simple. He took off his Panama hat. Then he was ready for bed. At half-past one he called at my door. The pleasant, motherly old landlady brought us chocolate, the horses were saddled, and the baggage was placed on the mule, the stout bar was taken down, the wooden doors of the courtyard were unlocked with a ponderous key, and we passed out into the cheerful moonlight. The way out of Nandine was not easy to find, and I rode with my guide, but when once out of the town I found it more pleasant to ride on alone. Shortly before dawn two men overtook and passed me, a colt following one of the horses, and one of the men carrying a gun across his saddle. I speak of it because this was the only case anywhere in the country, in towns or on roads, where I saw any person carrying pistol or gun. The horses of these men had an unusually fast amble, the universal gait for traveling, and as my horse had a slightly slower amble, but was anxious to keep near the horses and colt ahead, I allowed him to do so, as it quickened his step, and we kept in sight of this party as far as the outskirts of Granada, where they stopped to rest a little, and I passed them.

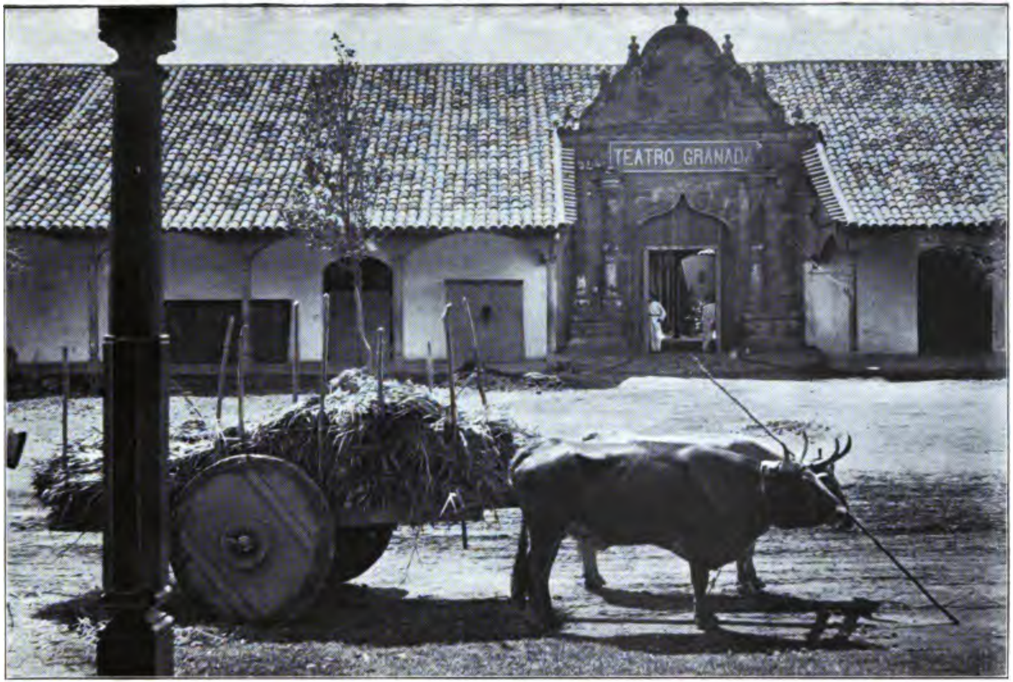
Granada is one of the chief cities of the country. It is on the shore of Lake Nicaragua, in a fertile country containing some famous coffee estates; there are tall mountains in view, and the city has broad streets with substantial buildings. Its population is fifteen thousand. The entrance to the city was exceedingly picturesque. The daylight had come. From higher points glimpses of cathedral spires and of the blue lake were to be had; the scattered houses became more frequent; regular streets appeared; then the Plaza, and at last, at six o'clock, I rode up to Downing's Hotel, the best in Granada, the resort of all Americans, both residents and visitors, and a really comfortable place. Coffee was ready on the tables, spread along two sides of the inner veranda, where green screens cut off the glare from the courtyard, and pictures adorned the walls. After coffee I went to sleep in my room.

In Granada I had the pleasure of being introduced to ex-President Cardenas, and held an extremely agreeable conversation with him. He had served a term of four years and was again in private life. He introduced his son, a civil engineer, who had studied his profession in the United States. Both spoke English readily. Afterwards I saw the ex-President several times at Managua, where he resides. His study or office looked like the abode of a scholarly public man. It had abundant books in tall cases, and all around on tables were public documents, a large terrestrial globe, and some fine atlases, among them some of the best made in Europe. Mr. Cardenas had visited the United States, was acquainted in Washington, and knew a number of our public men and some of our Presidents. He had retired from the presidency no richer than when inaugurated, and enjoyed the respect of all. He was in office when the present concession was granted and he signed it on behalf of Nicaragua. I showed him the able speech of Senator Shelby M. Cullom in favor of the canal, delivered in the Senate in 1894, and when he took it he said that he had made such a study of the canal question, and for so many years, that he was always glad to receive any fresh additional information on that topic. His political party being then out of power, he was reserved as to what particular modifications of the concession could be obtained, but said that if the United States government itself should ask for any modifications, its request would undoubtedly be courteously received by Nicaragua, and efforts would be made to come to an agreement.

In Granada I met some other leading men and discussed the problem which most perplexes the country,—transportation to the Atlantic. The world's markets lie on that side, and there is now no way of moving crops and freight in that direction except the small steamers down the San Juan, infrequent, and requiring several transfers at low stages of water. Accordingly, almost all the exports of the country must be shipped to one of their Pacific ports, then carried down to Panama, landed by lighters,—for steamers do not come up to the docks at that city,—and then carried by rail across the Isthmus. What Nicaragua needs very much is rail communication across the mountains to Bluefields, on the Atlantic. The road has been surveyed, but the Nicaraguans cannot secure the necessary capital. Meantime they are waiting for better news about the canal, and all were glad to see some one from the United States who feels an interest in their chief ambition.

I had arrived on Sunday. That being the chief evening for amusements, a troupe from Spain gave the opera of Boccaccio with much animation, and before a full house. The audience was extremely well dressed and followed the opera closely, applauding often and generously. All classes, the dark-haired, bright-eyed ladies in the many boxes, the substantial-looking gentlemen in the orchestra chairs, and the Indians grouped at the rear seemed to understand the music well and to be greatly pleased with it.

From Granada I traveled by railroad to Managua. We started at 3 P.M., arriving at 5:30 P.M. The distance is 32 miles and the first-class fare is $1.95. The stations in both cities are extremely neat and attractive, especially that in Granada. We passed Masaya, where there is a large Indian population, said to be about fourteen thousand; and there, as well as at the other intermediate stations, long stops were made and our passengers went out to buy cakes, candies, pineapples, and cooling drinks from the Indian women who thronged the platforms. Managua is the capital, and has a population of eighteen thousand. There was good cab-service, and I was driven rapidly to the Grand Hotel, kept by Mr. Lupone, an Italian, and well kept; it has the reputation of being the best hotel in Central America. Mr. Lupone, having been advised, in advance, of my arrival, came forward himself to arrange my quarters. He gave me the choice of a room on the ground floor, *abajo*, as they say, or one *arriba*, on the second floor. When I chose the upper, he said that was his preference also. The building was at the corner of two streets, built around a spacious court containing grass and flowers, and open to the sky. The inner veranda around this court was also two stories high. The part of this veranda on which my room opened was 9 feet wide and 166 feet long. At its farther end was a commodious bathroom, with running water, a place of great interest to the tropical traveler. I will describe my room, as such details show the hotel-life of the country. It was sixteen by twenty-four feet, the side walls fourteen feet high, no walls between any of the rooms



IN GRANADA.

on that floor above this height, and no ceiling, the steep-pitched tile roof being in view. This was for ventilation. The room had no windows. Two large solid doors, six by nine feet, opened on the inner veranda, and two similar doors, with hinged openings in the upper part, led to a private balcony, accommodating two large chairs. Two single bedsteads stood, one in each corner, on the right, made of iron, with brass tips, having an iron canopy, and over this a mosquito-bar, looped back with red ribbons during the day. There was nothing on the bedsteads except a strip of white canvas, tightly stretched, three pillows, two sheets, and a white spread. Any one who wished it could have an attractive blanket, very thin, spread between the canvas and the lower sheet. The floor was clean and bare, except for a small red-and-white straw matting, twenty by forty inches, neatly bound, and laid before each bed. On some of the beds there was a pretty piece of matting, straw-color, woven just the size of the bed, to be placed between the canvas and the sheet. It was an admirable arrangement for the warm nights.

The way of living at Managua is ruled by the climate. I was called at half-past five and went down to the dining-room for coffee and bread, which was always ready for everybody at the latest by six o'clock. Then I went to ride about the city, which was picturesque in architecture, or into its suburbs, or far out into the country. My custom was to return at nine or ten o'clock, always stopping somewhere about eight o'clock for fresh coffee. A bath came next, one of the most pleasant events of the day. Breakfast was at eleven, of several courses, admirably served; linen, glass, china, and service as good as in any hotel in a place of the same size in this country, and the cuisine incomparably better. After breakfast some smoked over their coffee at the tables, and some adjourned to the cantina, a large room at the front of the house, combining a gentleman's reading-room, billiard-room, office, and bar, containing also chairs and tables. This room was the resort of all Americans residing in the city, and of some of the best of the citizens of the country. After seeing friends, or taking a walk, keeping along the shady side of the streets, I usually went to my room at one o'clock for a little sleep, the town then appearing deserted. About four o'clock there was less heat, and a short walk was pleasant. Dinner was at five, and later I sometimes joined Mr. Lupone for another ride, or sought friends. People began to come to the cantina by sunset, and all through the evening it looked like any popular café. No special evening amusements were offered in the city, and by ten o'clock the place was quiet. All the serious business of the day and all calls of any importance are disposed of before eleven in the morning. As the climate tends to render people too averse to occupation, all billiard-rooms throughout the republic are required to allow no games before four o'clock in the afternoon, and they enforce the law, the rooms being open, but the tables kept covered.

When in Managua I had the pleasure of calling with my letters on the President, General Zelaya. He was seated at the head of a large table in one of the apartments of the palace, with some officials along the table at his left. The secretary who conducted me retired, and General Zelaya gave me the chair at his right. He discussed the friendly relations between Nicaragua and the United States, and gave me the last annual report of his Railroad Bureau, all the maps in the report having been drafted and lithographed in Nicaragua, very much to the credit of their artists. He also gave me a pocket copy of the Constitution of Nicaragua. We then discussed the canal. He spoke like a man familiar with business affairs, and his general tone was extremely friendly. He is in middle life, with a military bearing, and looks like a natural leader of men. He was extremely desirous that work on the canal should be resumed, and the whole undertaking completed as early as possible.

When the time came to leave Managua, I made calls on acquaintances, also leaving a card at the palace for the President, and embarked on the steamer which sails at ten A.M. along the coast of Lake Managua to Momotombo. The lake is exceedingly picturesque, various mountains are in sight, and the views when approaching the tall mountain Momotombo and the small mountain Momotombito, the Little Momotombo, are delightful. Breakfast was served on board at eleven o'clock. Arriving at Momotombo about two o'clock, we took the train in waiting there, and after an hour's delay, began our crossing to the Pacific coast. The grade was steadily upward, and we crossed a ridge 290 feet in height before reaching La Paz, the first station. The railroad was found to be thereafter laid along a tolerably level valley without special elevations, passing Leon, the chief city of Nicaragua, and thence on to Corinto, the principal Pacific port. The distance from Momotombo to Corinto is fifty-eight miles.

Before we reached Corinto I had become acquainted with quite a number of my fellow-passengers, some of whom were to sail with me by the steamer on the following day. Arriving at Corinto at six P.M., we all stopped at Pappy's Hotel, kept by Captain Pappy, a jovial Italian. Our steamer, the San Blas, came in at dawn of the following day, but did not sail until evening, giving us a full day ashore in Corinto. There I had the pleasure of becoming acquainted with some of the largest land-owners in that department of Nicaragua,—and with their families, also, who were there to meet their friends,—and had some most interesting and instructive conversations on their landed interests, irrigation systems, stock-raising, and social life on the large estates in the country. Corinto lies on a bay, about two miles from the sea, a fine natural harbor.

Coming out to sea at sunset we found the Pacific smooth and warm. As we sailed on a southerly course toward Panama, it did not grow any cooler. Our steamer was well-appointed, and carried many well-to-do people from Guatemala on the way to Europe by New York. We did not pass close in at Brito harbor, which lies about one hundred miles south of Corinto, but going into Captain McLean's room to see how he laid his course and worked the ship, I was invited to look at the admirable charts of the Hydrographic Office in Washington, and we found by the soundings noted on them that one mile out from Brito headland there were twenty-four fathoms of water, two miles out thirty-four fathoms, and at 105 miles out 1,832 fathoms. The ten fathom line is only about four hundred and fifty yards from the coast at this point, while farther north it is in some places five miles out. The special chart of our Hydrographic Office for Brito harbor, received since my return, shows that the entrance to the proposed canal harbor will be in six fathoms, taking the shore just as it is, without any dredging.

The coast bends so far south that we had to make ninety miles of northing to get back to Panama harbor. Going ashore, I crossed to Colon by train the next day, first having driven out to the Pacific mouth of the French Canal, a few miles above Panama, and also through their hospital grounds in the suburbs. The extent and evident organization of these buildings tells one part of the story. The French are a brave nation, and they made a desperate struggle to do the work at Panama, but it was beyond their power. Some fatality seems to have attended them at every turn,—in the preliminary surveys, location of the route, letting of contracts, administration, and sanitary conditions. The hospital is extensive, with carefully kept grounds, to which strangers are admitted by ticket, and is on the cottage system, with some central buildings and groups of small buildings around them. The whole system was maintained by voluntary contributions from all parts of France.

The line of the canal is, in the main, near the route of the railroad. The lowest point of crossing which the railroad builders could find anywhere was 245 feet above the sea. This was near the famous Culebra hill. Steam-shovels of unfamiliar French and Belgian designs, floating dredges, sections for iron bridges, in fact an endless extent and variety of construction equipment, were stored all along the line, all of it neatly painted, well cared for, apparently, and waiting news from France. In the Culebra cut, gravel trains were moving, engines smoking, and apparently quite a show of work going on. I was told that one thousand men had been employed a few weeks before, but possibly it was mainly to prepare all the extensive plant, spread over thirty miles of distance, for the coming rainy season. I have no intention of criticising that undertaking. It is a sad sight. My cab-driver at Panama was a Jamaica negro, and of course a British subject. When I asked him whether the canal could ever be built, he answered: "Not by the French, sir. It could be by the English, if they would take hold, or [here he brightened up and spoke vigorously] the Americans. They could do it!"

At Colon the fine Pacific Mail steamer Colombia was waiting for us at the wharf. She had plants for electric light and ice-making, and a capital table. The voyage northward from the tropics was very agreeable. Our flag is rarely seen at sea, but one day, when on the bridge with Captain Henderson, we sighted two schooners crossing ahead of us. There was no mistaking their trim, yacht-like air. Their fine lines, easy action, and taut white sails showed that they were American before we could make out our flag, which they soon ran up. One lowered a boat to hail us for newspapers. The steamer's last papers had all been given to the American fleet, which had just visited Colon, but making out that they were fishing-schooners, possibly from Gloucester or some place on the Massachusetts coast, and recalling the civilities received when in their home waters, I brought up a few papers from my own cabin, to which the captain was able to make some liberal additions. The manner of delivery at sea is to lash the bundle securely to a small board and throw all into the sea as the ship passes the small boat. Later we passed the eastern coast of Cuba going close to the three-miles limit. The affair of the

LEON.

Allianca, the American steamer fired on by a Spanish man-of-war, had taken place at that very point near the coast; all the details were described as we steamed by.

Our passengers were almost all from Central America, and Spanish was spoken at all the tables. The hours for meals were: breakfast at half-past ten and dinner at five, with coffee and rolls, for which many appeared, at six in the morning. The Spanish-American children playing on the deck were mystified as we met cooler weather a day before reaching New York, holding up their chilly hands to their parents as if an accident had occurred. One of the latter explained to me that cold was something new for his children, six or eight years of age. They had never experienced the sensation before.

We landed at the company's pier at the foot of Canal Street, the seventh day, the run from Colon being about two thousand miles. The steamers are ingeniously arranged for both cold and tropical weather,—steam heat in the staterooms, and a tidy white gangway, electric-lighted, all along the outside of the staterooms, having wide, square ports on the outside, so wide as to form almost a continuous opening, swung up to fastenings on the deck above, and kept open night and day in warm weather.

CHAPTER X.

SHALL THE UNITED STATES ASSIST?

It is obvious that the foreign policy of the founders of the republic must be modified as conditions change. They laid down the best rule possible for a struggling young nation in a new part of the world, "no entangling foreign alliances." As a subdivision of this policy, and also because its available capital was small, the United States has never consented to become the owner of any national interests outside of its jurisdiction.

American citizens, as a nation, keep their money invested in the United States to a greater extent than the people of any other first-class power. This country required to become one hundred years old before its citizens acquired the taste and the means to take any large foreign investment. At that time railroads in Mexico were discussed, and our people, chiefly New England men, subscribed and paid out fifty million dollars to build the Mexican Central railroad, a line twelve hundred miles in length, from El Paso, Texas, to the City of Mexico. We are yet novices, but occasionally one learns of considerable investments of Americans in different parts of Mexico, Central America, and South America. It is certain, however, that the taste for these foreign purchases is plainly increasing. So also are the trade movements and flow of our population southward. This is chiefly due to the low interest rates at home, to which we have been coming of late years. Government securities have fallen from 6 to about 3 per cent; all the 7-per-cent first-class railroad bonds will soon become due, and are now being replaced by new securities at 4½, 4, and occasionally even 3½ per cent. The interest on mortgages is everywhere falling. Capital for investment is at the same time rapidly increasing, and a demand among our people for profitable investments has now begun and will every year increase. It is this which will, in the future, lead them to seek more and more for higher returns from investments in other countries.

Every state owes duties to modern civilization, and this great interocean transit in Nicaragua has clearly become a great necessity for the commercial world. Who is to step forward and supply it? Who is to control it? Would we be satisfied to see France, had there been no experiment at Panama, follow the successful example at Suez and cut the way across Nicaragua, a board of directors, seated at their table in Paris, fixing the charges to be imposed on all water-transfer of our Pacific Coast products to New York and Europe, and laying down the tolls to be paid by our Washington authorities for our men-of-war? Men may say they would be satisfied, but the general opinion of this country certainly is that such a state of affairs would soon grow unendurable. Shall any other country build it,—Germany, for example? Acquisition of territory by force, arising first out of trade with a weaker country, then some small commercial disagreement, and next the landing of troops to protect the merchants, is not so distasteful to other nations as it is to us. Take the Suez Canal. England did not even build it, but acquired her shares in the canal company years after its successful completion. Yet now England has occupied Egypt. How long would it be before Nicaragua would have some small difference with almost any European company owning such a canal, which would lead to a military occupation of the entire country, ostensibly to protect the large canal interests? It could be justly said that the necessities of modern commerce had first demanded the canal for many years, and that after being asked, we had refused to construct it. Equally forcible would be the point that its construction by the foreign company in question, had brought greater benefits to this country than to any other in the world, and that we, of all nations, were most estopped from making any objection to what the rightful owners considerd to be the best steps to be taken for the protection and safe operation of their great property. It is also to be remembered that although with us the rule is different, yet in all other nations large holdings abroad by their citizens, and large holdings by their governments, are treated substantially alike when it comes to any question of protection, and that treatment is to send warships at once. Men who say that it will be quite as satisfactory to permit the larger portion of the securities of the canal company to be owned by citizens of some foreign country as to own them ourselves have not considered this aspect of the subject.

It has been asked, How is the United States to protect its investment if it places seventy million dollars or more of capital in this Nicaragua canal? Some party may grasp the political power in those countries, which will seek to confiscate such a valuable property; or in some great public disturbance, some revolution, one of the contending factions may stop the passage of vessels. The answer is, that every kind of property requires care, and it is always possible that some emergency may require the United States to send a ship of war there, or possibly a small force of men may occasionally be needed on shore to protect canal buildings or other property. It would not be a new case. A company of American citizens, under a concession obtained from the Republic of Colombia, built a railroad across the Isthmus of Panama. This railroad owns terminal stations and all intervening station buildings, the necessary complement of locomotives and cars, and has also built and operates a telegraph line. This has continued during nearly forty years. Colombia seems to be always about to enter or about emerging from a revolution. There is one going on there now (1897). No passing government tries to confiscate the Panama railroad. When I crossed by this railroad, returning home, although a revolution was in progress, there were no signs of war. Trains arrived and departed on time, and no one cared to interfere with the property. In time of revolution, culminating in riot, the railroad company has occasionally called on our government to protect its property, and the authorities have responded. Several times forces of the United States have been landed at Colon or Panama to assist in guarding the railroad. Such periods of disorder are rare.

They soon pass over. That investment has been there a long time, giving employment to a number of our citizens and earning dividends for its owners. It has been demonstrated that such a company can be successfully managed by American owners and its possessions be easily held. Commonly a sharp cablegram from Washington answers every purpose.

Such an undertaking would be very large for any private company, and it has been now demonstrated that it will be difficult for such a company to raise the money in the United States. The financial world is so large that it is not easy to speak comprehensively of what can be done in any part of it. Still, of the three foreign countries where the capital could most likely be obtained, France, Germany, and England, it is to be noted that France would not likely make large investments in such a canal. That nation subscribed for the Panama Canal solely on account of the success of De Lesseps at Suez, the five hundred francs shares of the Suez company having at times sold as high as four thousand francs, but the Panama failure has made all canal undertakings distasteful to the French. Germany fared worse in the depression of 1893 than the United States, and this is by no means the time to bring out any large company in that country. The Germans, too, have shown a preference for another class of stocks, their chief investments, in the United States at least, having long been railroad securities; and there is nothing to show that any considerable capital could be obtained in that country for a canal undertaking. As to English capital, the plans of the present company to issue bonds for the total cost of the work, and to begin business in debt for the entire construction, are looked upon as unsound by the ordinary English investor, and it is further to be noted that the now dominant and always increasing political influence of the United States in Central America makes too difficult any assertion of government force by England should local disturbances arise. The great banking-houses of London sometimes subscribe for new undertakings on a large scale, but not with the intention of investing for permanent holding. The expected destination is the moderate or even small investors, and no securities of this character can be easily sold to the great houses which they, in turn, could not sell to these classes. The small English investors sometimes feel more strongly than the large ones what a factor the increasing power of the United States in Central America is becoming.

There is one great difficulty, however, in the way of any private company raising the necessary capital, no matter in what country, and that is the fact that the total cost can never be known in advance. The estimates for Suez were forty million dollars, and the actual cost proved to be eighty-nine million dollars. For Manchester the estimates were twenty-eight millions, and yet on ground as familiar as the very heart of England, it proved that seventy-five million dollars was necessary. In Panama, after an expenditure of two hundred and sixty million dollars the work is abandoned, and all subscriptions have proved a total loss. The investing public the world over knows of these experiences, and fears placing money in the securities of any company proposing to cut a canal across Nicaragua.

Should the present company, by any possibility, raise the capital necessary and build for seventy million dollars, as expected, it would be obliged to sell one hundred and sixteen million dollars bonds should the best price obtainable be sixty cents. That was the price at which the Suez Canal bonds were sold, and this, with one hundred million dollars stock, would make a capital of two hundred and sixteen million dollars. Annual dividends of only six per cent, with six per cent bond interest to be met, to say nothing of maintenance, would be a serious tax on our commerce. Should construction cost more than expected, say one hundred million dollars, the tax would be still more burdensome.

Interest on capital during the period of construction would become a considerable addition to the total cost should the work be done by a private company. Government aid, charging only three per cent interest, and the more speedy construction to be obtained when ample capital is at command, would greatly reduce this item of interest in the cost.

The enterprise, from its very nature, can best be undertaken through government aid. There is but one government which should furnish the capital and hold the consequent control of the canal, and that is the United States. To construct it seems in line with the most important changes which are likely next to occur in our development as a nation. On close analysis, too, it would appear to be not so much a going beyond the lines of our jurisdiction as an extension of, or the closing of a gap in, our southern coast-line. Even if we were reluctant to act, yet, as the leading nation of the western hemisphere, the United States cannot live wholly for itself. The modern idea is that all success and wealth bring with them corresponding obligations.

NATIVE SCENE, LEON.

A nation owes duties to civilization as truly as does an individual.

There are three courses now open to this country.

1. To let the present company go on with the work under the terms of its concessions, the United States guaranteeing its bonds to an amount sufficient to pay the entire cost of the canal.

2. A better plan would be first to obtain amended concessions, allowing the United States to become the owner of the canal in case of a foreclosure, and granting jurisdiction both during and after construction to a suitable consular court.

3. By far the best plan would be to surrender the present concessions altogether, our government repaying to the canal company its actual cash outlays to date. The United States should then purchase from Nicaragua and Costa Rica, paying a just and reasonable price, a narrow strip of territory from the Atlantic to the Pacific, which would include the site of the canal and a suitable tract on each side, just large enough for the work of construction and operation. This would be following General Grant's advice of an American canal on American soil by the American people. There would then be no questions of jurisdiction, and the territory so acquired,

including the canal, would be governed by the regulations established by Congress in the same manner as our possessions in Alaska. The canal would be constructed by our government just as it builds its harbors or public buildings; that is, through appropriations by Congress, and according to the plans and under the direction of the engineer corps of the United States army. There would be no scandals in construction or operation, and no foreclosures. All the money for construction would not be needed at once, and appropriations could be made annually out of our current revenues, and the cost so distributed over a term of years that it would scarcely be felt. Should, however, our revenues be found insufficient, government bonds could be issued. Congress could prescribe the tolls to be paid by ships using the canal, making the charges sufficient to meet the expenses of operation and a suitable interest on the capital invested in the undertaking, and also, if considered advisable, for an annual payment into a sinking fund to meet, at maturity, any government bonds which might have been issued. As commerce increased, the tolls could be lowered, and any other reduction in favor of American ships, found desirable as an aid in building up our carrying trade, could be made by the same authority. If any European complications as to the use of the canal arose, our government would not be hampered by the existence of a canal company, nor by being obliged to obtain the concurrent action of Nicaragua and Costa Rica, but would be in a position to decide for itself what course to take. The possible claims of England to joint control of the canal under the Clayton-Bulwer treaty should be ignored. Those claims could never be allowed, and we probably would hear little of them after we had constructed the canal with our own money and were in full possession. The Suez Canal has been neutralized by an agreement between the great powers, but that waterway is closely connected with the Eastern Question, the balance of power, and other large subjects involving the nations of Europe. There is no analogy as to neutralization between the situation at Suez and that at Nicaragua.

It is hoped that these notes may be of some slight service in partially supplying that information about the canal which our people desire before more strongly calling on Congress to take action in its favor. They may, too, aid persons visiting Nicaragua on business other than that of the canal. Should Congress vote to assist the construction, they may be of some aid to those whose employment will then be in that country. The suggestions as to concessions, plans, estimates, and letting of contracts are suggestions only, and may, perhaps, aid in calling attention to the points discussed, so that others may take them up and evolve something still better.

ADDENDA.

The recent war with Spain has changed the projected Nicaragua Canal from a contingency to a necessary step in our national development. Fortunately, also, we have had a practical illustration of how important it might become in time of war. The battleship Oregon, 10,288 tons, which had been built in San Francisco, and had remained in the Pacific, was suddenly needed in the Atlantic, war with Spain being imminent. Battleships are not built for cruising, and no such ship had ever rounded Cape Horn. The Oregon, under orders for dispatch, left San Francisco March 19, 1898, steamed 4,666 miles, without a stop, to Callao, Peru, where coal was taken; thence to Punta Arenas, in the Straits of Magellan, where she encountered stormy weather; thence to Rio de Janeiro, to Bahia, to Bridgetown, Barbadoes, and thence to Jupiter, Florida, a distance of 15,987 miles, the voyage requiring fifty-five days.

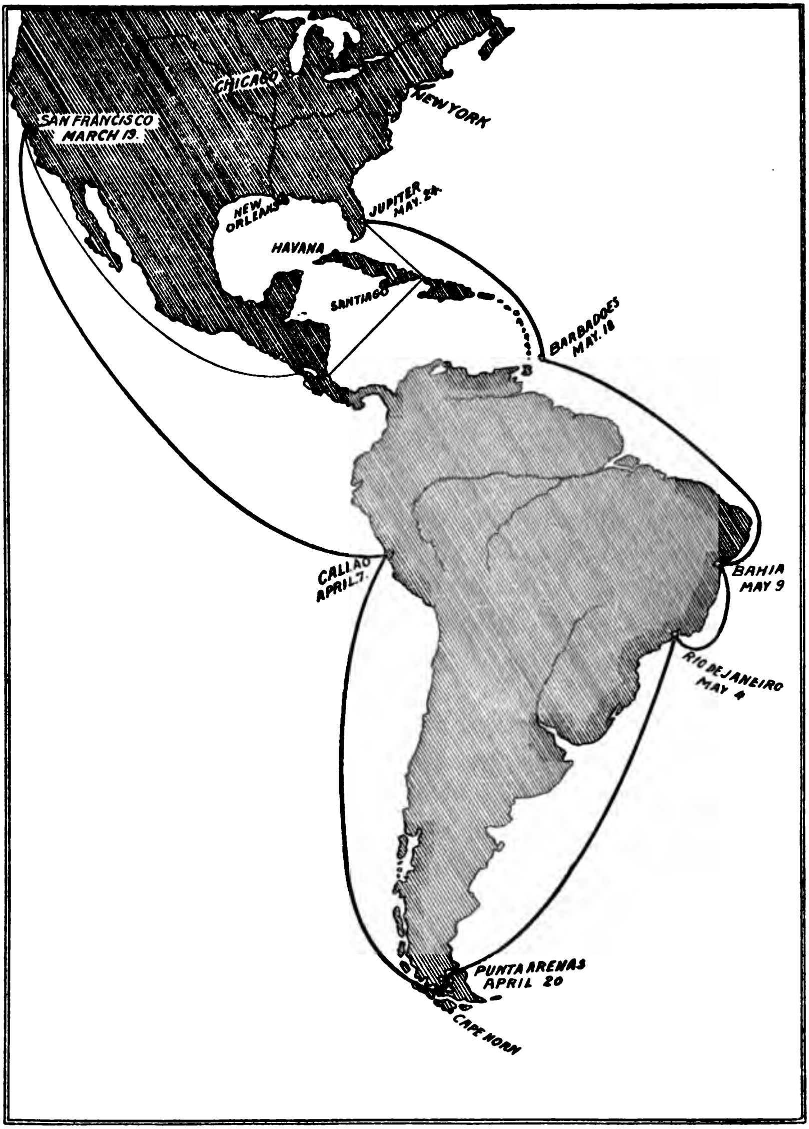
Below is a table of the exact details of the voyage, as revised from the log-book of the Oregon by the Bureau of Navigation, Washington:

Date.	Port.	Distance, Knots.	Time, Days.
March 19	Left San Francisco		
April 4	Arrived Callao*	4058	16
April 7	Left Callao		
April 16	Arrived Straits of Magellan	2502	9
April 17	Arrived Punta Arenas*	167	1
April 20	Left Punta Arenas		
April 30	Arrived Rio de Janeiro*	2270	10
May 4	Left Rio de Janeiro		
May 4	Arrived Cape Frio	50	1
May 5	Left Cape Frio		
May 8	Arrived Bahia	703	3
May 9	Left Bahia		
May 18	Arrived Bridgetown, Barbadoes*	2484	9
May 18	Left Bridgetown		
May 24	Arrived Jupiter, Florida	1668	6
	Total	13902	55

* Stops for coal.

The distance from San Francisco to Jupiter via the Nicaragua Canal is 4,190 knots, a difference in favor of that route of 9,712 knots. Had the canal been in operation, and twelve knots an hour her average speed, the Oregon could have reached Jupiter in fifteen days.

Our success in the late war with Spain was due in part to Spanish lack of aggressiveness and deficiency in marksmanship, target-practice with large modern guns being too costly for a poor nation. Some stronger power may begin a war by attacking our Atlantic coast cities at a time when our best ships are in the Pacific. In such an emergency the Nicaragua Canal would be of value too great to be estimated.



MAP OF ROUTE OF U. S. BATTLESHIP OREGON.

PRACTICABILITY.

Reference is made on page 12 to the importance of the general concurrence in opinion among engineers that the proposed ship canal in Nicaragua is a feasible undertaking. This concurrence in the profession is so unanimous as to be almost extraordinary. The present canal company has made so many efforts to obtain capital in the financial centers of Europe, the financiers in turn referring the practicability of the proposal to their own engineers, that the plans for the canal have become widely known. It has now been my good fortune to learn the opinions of able engineers of England, Germany, France, Italy, Greece, Egypt and India, and without a single exception they have all pronounced in favor of the undertaking. It would not be strange if, here or there, one should hold an adverse opinion, but if there is one such I have not met him.

One evening in Egypt, when I was returning on the steamer of the head engineer of the Suez Canal Company, after a detailed inspection of the harbor works, the currents and the system of dredging at Port Said, the conversation turned to the Nicaragua Canal. There were four in the party, the other two being the chief engineer of the Port Said Division, and the Chief of the Bureau Technique, and the discussion was of the most impartial, vigorous, hard-headed character. The conclusion was unanimous that the Nicaragua Canal was an entirely practicable undertaking, and that modern engineering skill could accomplish it.

I met in Cairo Major R. H. Brown, of the British Royal Engineers, bronzed, cool and cautious, in charge of the entire irrigation system of Lower Egypt. These English officers of standing have constructed so many works in warm countries that the Nicaragua plans do not appear to them either novel or difficult. Major Brown has said that the conditions as they have been stated to him do not seem formidable enough to frighten American engineers, and also that he expects that the American people will construct the canal in time for the use of the present generation. He has also made some valuable suggestions, based on English experience in India.

The English Admiralty has recently contracted with Sir John Jackson to build the new harbor extension at Plymouth, at a cost of £3,000,000; and under date of August 4, 1897, he speaks of the Nicaragua Canal as "this great scheme, which sooner or later it would appear must be carried out to the advantage of the world at large." I give his views on practicability because they are those of a man at this moment engaged in executing so large and important a work. He says, "On the information I have had before me, I should say there are no insurmountable engineering difficulties in the way, providing the work is placed in the hands of engineers and contractors of high standing and practical experience in this class of work, and that sufficient money is provided in the first instance to carry out the work in a proper manner. I, for one, wish the scheme of a canal at Nicaragua all success.

"I have recently imported, for my works here, Oregon pine of a value of over £50,000, upon which alone there would have been a material saving to me had the canal been in work."

Sir John completed, as contractor, the Manchester Canal, and it was for this he was knighted.

A commission of engineers, of which Rear-Admiral Walker is chairman, was appointed by the government in 1897, and has since been carefully examining the route of the canal. A report by this commission is soon to be made.

In December, 1897, a considerable number of the contractors who have been constructing the Chicago Drainage Canal visited Nicaragua, accompanied by able engineers. Since returning they have made no announcement of the price at which they would undertake to construct the canal, but have stated that they found no special engineering difficulties in the way; that they could readily manage work in that region, and that as soon as proposals are called for by responsible parties, together with assurances of protection by our government, they will be ready to submit bids for the construction of the entire canal. They have stated that it will be a part of their plans to use efficient machinery of the latest invention as much as possible and to reduce the employment of labor to the minimum.

JAMAICA.

It is impossible for a white man to work in the sun in Central America. He can superintend, but he cannot labor. The work in Nicaragua must be done by natives of the tropics, and the most efficient to be had are those from Jamaica. That island belongs to England. I visited it in the spring of 1898 and looked into the labor question. The population is 639,491, of which only 14,692—less than three per cent—are white. The others are negroes. They are taller, heavier and more efficient than those in our Southern States.

The climatic conditions are so similar to those of Central Nicaragua that an examination of the railroad and public road systems is very instructive. Many persons seem inclined to think that public works of magnitude cannot be maintained in Nicaragua, simply because it is in the tropics. For those who so think it would be interesting to see what capital and engineering skill have accomplished in Jamaica. The island is one hundred and forty-four miles long, with plains, table lands and a mountain range along its entire length, having peaks as high as 7,000 feet. The average annual rain-fall on the southern side is 66.54 inches, and on the northern side is 126.61 inches. Owing to the mountainous formation and steep slopes, the rivers rise rapidly. The Rio Minho, or Dry River, has been known to rise thirty-seven feet in a few hours. The railroad was begun in 1845, but only a few miles were operated until, in 1894, American contractors extended the system, which now embraces one hundred and eighty-four miles. The building, and especially the maintenance, of this railroad furnish many useful suggestions for canal work in Nicaragua. I passed frequently along the line, both by train and on foot, and observed that there was scarcely any washing away, or even guttering, of the embankments, the rapidly-growing vegetation protecting the slopes. As the plans call for a railroad along the entire line of the Nicaragua Canal, I give the following points on the maintenance of the Jamaica system, furnished me by Mr. T. H. M. Bonnell, superintendent of motive power, formerly with the Great Western Railway, England.

1. Ties from northern countries do not last long. A creosoted sycamore tie from the United States stands about one year, and one of creosoted white pine, one and a half to two years. Baltic white pine, creosoted in England, stands two to three years. These three kinds cost, delivered in Jamaica, $1.87 each. The poorest of all ties is oak. Cowcatchers and car-sills of oak give out early. American Southern pitch pine is the best wood for car construction. The best ties are of lignum vitæ, cut on the island, costing $1.12. Some ties of jarrah, the new Australian wood recently introduced in London for paving the streets, have been ordered for trial.

2. In the railway cuts the heat is often 130° Fahrenheit. In such a furnace-like temperature creosote evaporates rapidly. The heavy rains also wash it out, and parts of the line are occasionally under water.

3. Clearing vegetation from the line is a large item in maintenance account, vegetable growth of all kinds being rapid. Clearing is done chiefly by women, who are paid twenty-five cents a day. A man receives fifty cents, and a woman does seventy per cent as much as a man. Firemen are paid $7.50 a week, and engineers and conductors $12.50. All these are blacks. The tropical

swamps, profuse vegetation, heavy rains and intense heat are not insuperable difficulties. They are all met and provided for, and the railway is operated just as efficiently and regularly as railways in northern countries.

Mr. George G. Odell, chief engineer of the Giradot Railroad, Colombia, South America, recently said to me: “In building new lines I no longer use creosoted ties from the north. I begin by using the nearest native wood to be had, for it will last quite as long, and I try to get the road in running order as soon as possible. Then, as the ties wear out, I replace them with permanent ones of guaiacum (lignum vitæ), comula or other hard woods.*

The public roads in Jamaica are of great interest. Built by competent engineers, with easy grades, and kept in good repair, they demonstrate that highways can be built and kept in order in tropical countries quite as well as at home. Indeed, no State in our Union has roads of such excellence. They are quite abreast with even the standards of France and Switzerland. The older bridges are of stone, but eleven, which have been built since 1890, are of wrought iron, on masonry piers; the latest, crossing the Rio Grande, with six spans, is 520 feet long and 48 feet high. There are 1,850 miles of these fine public roads, of which 1,000 miles have been built since 1890. Maintenance receives attention quite as much as original construction. Every section of highway is in charge of a foreman, who lives at some point on that section. His men earn thirty to fifty cents a day, and the women twenty to twenty-five cents, the labor, however, being all task work and not paid by the day. The average annual cost of maintenance is $161 per mile. It is most agreeable, in the cool, early hours of the morning, to drive over these fine roads in neat carriages, with good horses, through beautiful tropical scenery.

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* While on the subject of using our American creosoted woods in the tropics, and recalling how the tropical insect, the toredo, has destroyed the pier work at Greytown, it is worth noting that Mr. John B. Dougherty, C. E., of Wilmington, Delaware, has built a pier at Savanilla, about six hundred miles below Greytown, of steel piles, six inches in diameter, ending in a cast iron screw. The pier is four thousand feet long and has twenty-seven feet of water at its end. It was completed in 1894. The piles are protected from the action of the salt water by a covering of cement. The durability of this pier will be watched with interest.

The chief industry of Jamaica has long been the cultivation of the sugar cane and the exportation of sugar. Owing to the development of the beet sugar industry in Germany and France, business in Jamaica is greatly depressed, and laborers for the construction of a canal in Nicaragua can be employed without difficulty and on favorable terms. The annual public revenues are $3,000,000, but in 1897 they failed to meet the public expenses by $447,500, and the estimated deficit for 1898 is $476,900. The failure of the Panama Canal Company left many Jamaica laborers at Colon in great need, and their government provided transportation home for them at considerable expense. To prevent a second such occurrence, a law was passed in 1893* requiring those engaging laborers for work in other countries first to sign, before a government official, a contract of service, with security, stating the nature of the labor, the term, the wages, and guaranteeing to the laborer subsistence in case of accident or sickness, and free passage home at the end of the term, or whenever disabled by accident or sickness.

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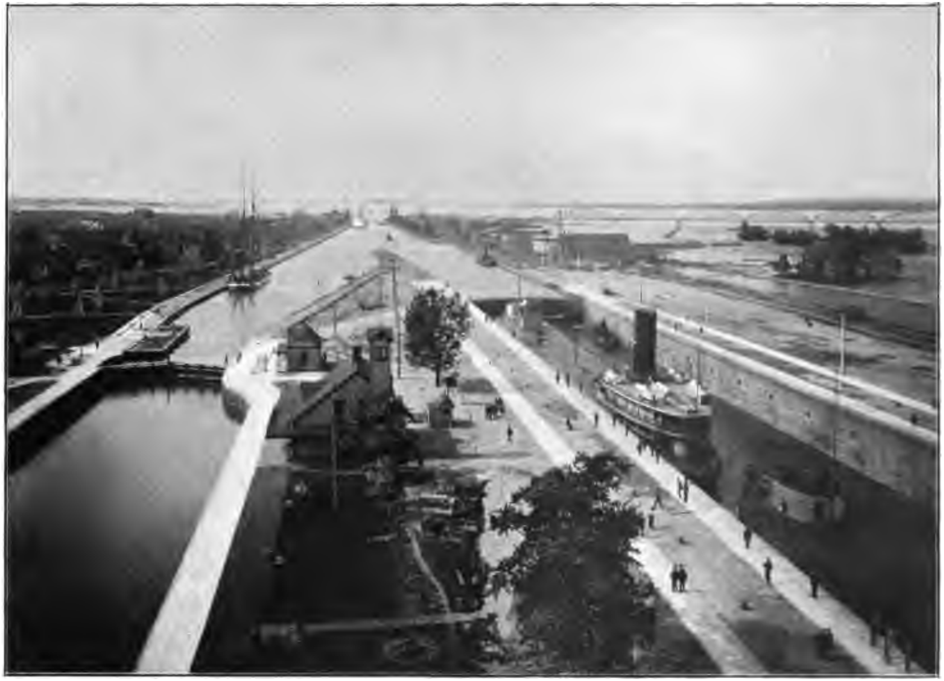
*35, Laws of Jamaica, 1893. Also 16, Laws of Jamaica, 1894. Government Printing Office, Kingston.

A considerable number of the people of Jamaica were employed in Nicaragua by the present canal company and its contractors. They were well housed, well fed, and had the best medical attention, and they have taken back to their island a good account of their employment. Nicaragua is a name which carries pleasant recollections in Jamaica, and some of these former employees told me that the men had received better food and wages than they were accustomed to obtain at home, and would be ready to go again to Nicaragua whenever work on the canal should be resumed. I had a full discussion of the subject with the Governor of Jamaica, Sir A. W. L. Hemming, K. C. M. G., to whom the British Ambassador at Washington, Sir Julian Pauncefote, had kindly given me a letter of introduction. The Governor laid considerable emphasis on the new labor protection laws, and intimated that their provisions would be strictly enforced; but, subject to this, he quite approved of the island furnishing as many of the laborers for building a canal in Nicaragua as might be needed, and thought that in the present condition of their labor market all the men who might be wanted could be obtained without difficulty.

SAULT STE. MARIE CANAL.

The United States government has already constructed one ship canal, and has charge of its



SAULT STE. MARIE CANAL.

maintenance and operation. The distance from Lake Superior to Lake Huron is about twenty miles, and the passage connecting the two lakes is called the St. Mary's River. It is here the boundary of Canada. Nearly midway are rapids, too swift and shallow for navigation, called by the French explorers Sault Sainte Marie (Saint Mary's Falls), and around these rapids our government has constructed a ship canal of the first class. It is one and a half miles in length, and at its lower end are two masonry locks, side by side, operated by hydraulic power, well equipped with electric light, used by night as well as by day, and named for two distinguished officers of the Engineer Corps of the United States Army, General Godfrey Weitzel and General Orlando M. Poe, who had charge of their construction. The Weitzel lock is 515 feet long, 60 feet wide, and has a depth of 17 feet of water over its mitre sill. It was completed in 1881, and cost $2,000,000. The Poe lock is 800 feet long, 100 feet wide, and has 21 feet of water over its mitre sill. It was completed in 1896, and cost $3,700,000. The lift between the lower and the upper level of the canal is eighteen feet. This canal is notable in two respects, the Poe lock being the largest in the world, and the tonnage passing being greater than that through any other ship canal. Owing to the severe climate of that northern region the canal was open to navigation for only 233 days in 1896, and 239 days in 1897. The shipping that passed in 1896 amounted to 17,249,418 tons, and in 1897 to 17,619,933 tons; the Suez

Canal tonnage for those years was 8,560,283 and 7,899,373 tons respectively. This is not the traffic of all the Great Lakes, but only that to and from Lake Superior. It is significant of the development and resources of the country west of Lake Superior. Sailing ships are disappearing, and the size of the steamers is every year increasing, the larger vessels being found more economical.

Passenger steamers of 2,240 tons pass through the canal and freight steamers of 7,800 tons. While looking over this highly successful undertaking in the summer of 1898, I was told of a resident whose father could recall the time when all the transportation at the portage, as it was then called, was done by a mule and a cart.

No tolls of any kind are collected. The canal is free. That it has been constructed, maintained and operated so successfully by our national government is an emphatic promise of how efficiently that government is capable of conducting the still greater undertaking in Nicaragua.

The Canadian government also has constructed a canal around the rapids, having a single lock 900 feet long, 60 feet wide, and with 20 feet of water over its mitre sill. This lock has more modern and efficient machinery than our own, and is operated by electricity. The tonnage above shown includes both the American and Canadian canals.

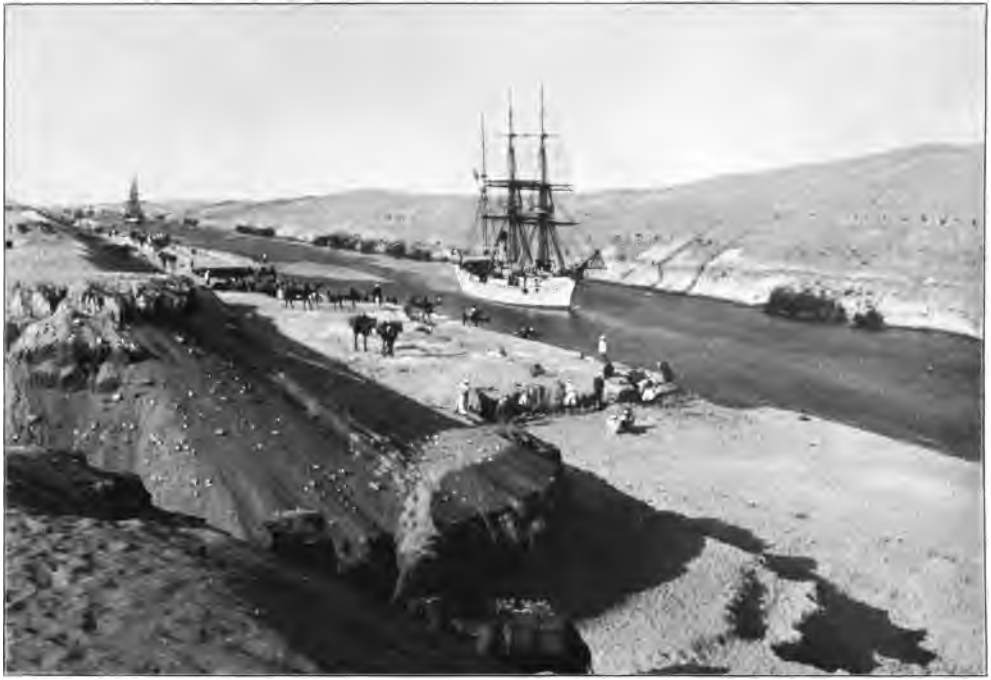
The new steel pneumatic lock referred to on page 82 is likely to have an early trial on the Erie Canal. The plans have been prepared, and accepted by the canal authorities, for a single steel lock at

Lockport, where the lift is fifty-seven feet, and another at Cohoes, where the lift is one hundred and forty feet. These steel locks are to be substituted for the long flights of five and sixteen masonry locks respectively, now at these points.

SUEZ CANAL.

Before our engineers decide upon any plans for Nicaragua, they should see the Suez Canal in detail. The commerce of the world is to be provided for, and there such provision can be seen. It will be an aid, too, in making plans, to see how a great ship canal is operated day by day. I examined the Suez Canal in August, 1897, with the assistance of the officials, and was especially interested in seeing how many things are required for a ship canal of the first class, which are not usually provided for in the preliminary estimates. There must be buoys to mark the limits for ships to avoid grounding, apparatus for lighting the canal at night, and mooring posts along the route at which vessels may be tied up to allow others to pass. Some of these are expensive affairs at Suez, each mooring being made of three heavy creosoted timbers, arranged as a triangle, perhaps four feet apart, and strongly bolted together by cross pieces at the top. Then there are signal stations on the block system, showing day and night signals as permission for vessels to pass. For the grounding of vessels, which is the chief annoyance of canal officials, tugs of extraordinary power, and a floating derrick for removing cargoes, and capable of lifting forty-two tons, are kept at Suez. A special steamer of the company attends through the entire canal every ship laden with petroleum in bulk. This steamer carries steel floats, to be thrown around the oil ship in case of fire, to prevent the burning oil from floating down the canal; it carries also specially constructed pumps and tanks to remove the cargo should the ship go aground. I saw the oil steamer Bullmouth, 25 feet draft, pass, so convoyed, and in the company's offices later in the day learned that the steamer had grounded some miles below. Some rags in the engine room had taken fire, the engineers had fled in fear, no one was there to respond to the pilot's signals, and the steamer had grounded. I did not learn the results. Devices for preventing the washing of banks require additional outlay. Along the sides of the canal the effect of the wash of steamers is quite perceptible. In some places brush-work protection is used, and in others stone walls. The former is not efficient, and the latter is too expensive. With all its experience, the company has not yet found any entirely satisfactory method of bank protection. Slow speed is much depended on, all ships taking the company's pilots, who keep the speed down to five knots an hour.

The widening of the canal is now completed. Where the banks are low, the width is 328 and 393 feet; and, where the banks are high, 246 feet. Ships can now pass each other anywhere except in the curves, one making fast to the mooring posts while the other goes by. The declared depth is now 27.88 feet, the actual depth being 29.52 feet. The



WIDENING THE SUEZ CANAL.—WORKING PARTY WITH CAMELS.

two lakes through which the canal passes were formerly a part of the desert where De Lesseps rode. One is nine miles across and the other eleven miles. They have lighthouses, and in fog ships even cross them by compass. These lakes recalled the similar feature in the Nicaragua Canal plan.

I went out on the canal with the Chief of the Bureau Technique to see the transit at night. Some steamers carried their own electric light, and others made use of a light hired from the company, which was in a large box hung over the bow and turned by a man in the box. We met, first, a French steamer, returning with pilgrims from Mecca. Later we met an English steamer having a cargo of rice, and using one of the company's large lights. We overtook and passed her on our return, and saw the efficiency of the light. As we came up from behind, all the canal surface was seen to be brilliantly illuminated and every buoy stood out as plainly as by day. It is estimated that the illumination is complete for twenty-three hundred feet in advance.

The company maintains excellent discipline among its officials and employees. The dress and demeanor of crews on the company's steamers, the manning and stroke of an ordinary four-oared boat, the transit and accounting staff in the company's offices, the silence, method and neatness in these buildings, were all like those of some national navy department. Long terms of service are the rule. The Chief of Transit who showed me the central division, has been more than thirty years with the company. I was pleased with a phrase they use.

They never say that they "began to work for the company," but always that they "joined the company" at a given date.

A pleasing fact revealed by acquaintance with the details of the company's administration is the spirit of friendliness and consideration exhibited among all classes of officials, from the directors down, and the good feeling toward the company among the employees. The labor market is oversupplied, yet the Arabs are systematically paid better wages by the company than by any contractors who undertake portions of the company's improvements. When visiting the dredges with the head engineer I was frequently pleased to see gray-haired employees, Frenchmen in grimy clothes and with bare arms, approach our party, respectful but confident, and offer to shake hands with Monsieur Quellenac, receive an always courteous, often kind greeting, a glance penetrating but considerate, a question or two about some details, and then return promptly to their work. In one of the later annual reports the directors refer, with evident satisfaction, to the improved sanitary provisions of the newer class of houses they are building in Egypt, and at Ismalia the company's hospital was pointed out, situated on higher and more desirable ground than even the town itself. In his address to the stockholders in 1897, Prince Auguste d'Arenberg, the president, though dealing with large affairs, was not above referring with pleasure to a medical detail, the complete success of the company's physicians in their new treatment of ophthalmia, especially among the little children of the employees, diseases of the eye being very common among the Arabs. He also announced that free schools had been established at several stations along the canal, taught by the wives of the station agents.

The Suez Canal is not embarrassed by bridges. There are only three crossings, all flat-boat ferries, worked by chain and windlass, the chain resting on the canal bottom when not in use. They are near Port Said, Ismalia and Suez, and are used chiefly by caravans. While riding on camels over the desert below Suez, we met one of these caravans, a typical caravan of the desert, consisting of pilgrims thirty days out on their return from Mecca, some of them going to distant Tunis.

De Lesseps is to receive suitable and permanent recognition. At Port Said a statue of the founder of the canal, looking out over the Mediterranean entrance, is to be erected by the company at a cost of $50,000.

Before completing the Nicaragua plans, it would be prudent to confer with the officials of the Suez Canal as to the depth of water they now insure to passing vessels, and as to their plans, if any, for increasing the depth. Suez and Nicaragua will together complete the shortest circuit of ocean travel around the world, and they should be maintained in harmony. Their interests are mutual, and each will help the other. By opening the way for many new business enterprises, by leading to the establishing of new steamship lines, and by increasing the volume of the world's commerce, the Nicaragua Canal will increase the amount of business done by the Suez Canal. The tendency now is to build, every year, larger ships, drawing more water.

In discussing the desirable depth for the Nicaragua Canal, Mr. H. Peters, chief engineer of one of the North German Lloyd Company's steamships, who has many times passed through the Suez Canal, made the point that when the latter is also in operation, the Suez and Nicaragua limits of depth will set the limits of draft for builders of ships, except for vessels designed for a special service, like the North Atlantic crossing. There are at present only about twenty vessels afloat which have too great draft to pass through the Suez Canal. The officials suggest that the three or four of these which are men-of-war might be taken through the canal, in an emergency, by removing their guns and coal to lighters. These twenty ships constitute so small a percentage of all the vessels using the canal, not one-half of one per cent of the 4,207 ships that passed in 1891, that the tolls they would pay would be practically no return on the enormous outlays which increased accommodation for them would require.

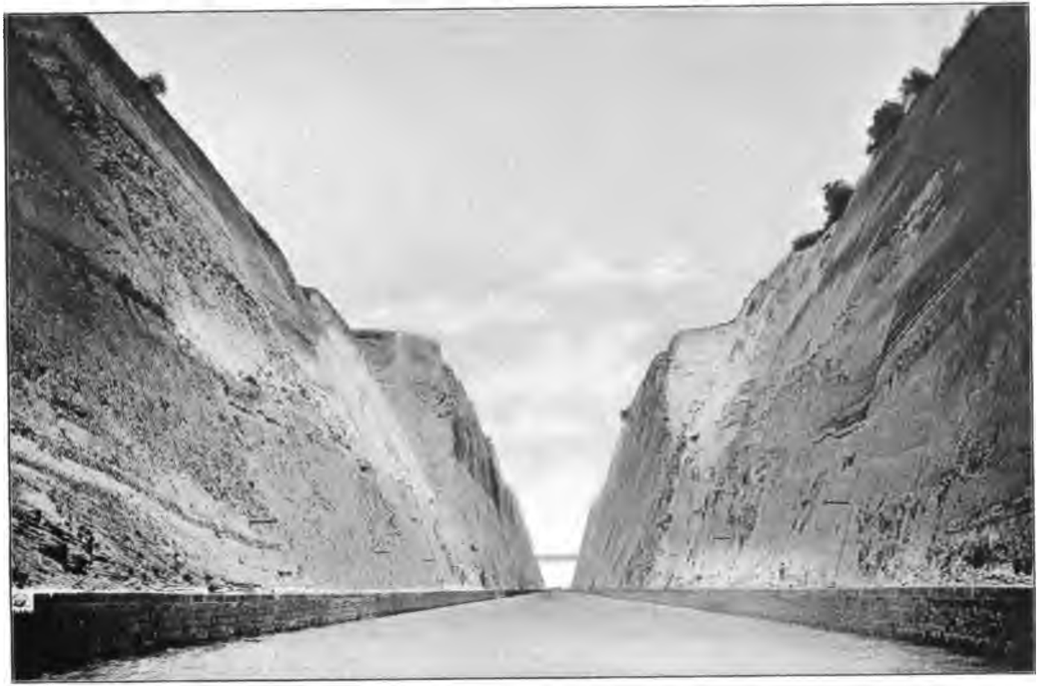
The following items complete to date the table of the business of the canal shown on page 128:

Year.	Number of Vessels.	Net Tonnage.	Receipts from Tolls.	Average Toll.
1896----	3,409	8,560,283	$15,297,543	$1.78
1897----	2,986	7,899.373	14,183,682	1.70

In all this impressive transit of the commerce of the world there were in 1897 only three vessels carrying the American flag. In 1896 there was not one. We have built a navy of the highest type, and we have demonstrated what it can accomplish. Surely the day cannot be very distant when our merchant marine also will have the nation's care, and when measures will be taken to restore it to its proud place of thirty-six years ago, when it constituted more than one-half of the total tonnage of the world.

CORINTH CANAL.

This ship canal is in Greece, a short distance south of Athens. It connects the Gulf of Corinth with the Gulf of Ægina. It was opened in 1893, and cost $6,000,000; the capital was obtained chiefly in France. It is 80 feet wide on the surface, 67 feet on the bottom, and has a nominal depth of 26 feet. It is about four miles long, has a small harbor at each end, has no locks, and is cut chiefly through a brown marl, which is harder than clay, but not so hard as soft rock, and which softens into a pasty condition under rain. The highest banks are 262 feet, and the slopes are very steep, being 40 feet for every 100 feet of height, with a view, the designers said, of preventing wash by rains. The tops of these high banks are without parapets or other protection, and much surface water flows into the canal from the adjoining lands. There is a foot-path from four to six feet wide along each side of the canal, near the water surface, and a deal of débris falls from the banks above on this footpath. A land-slip of 5,000 cubic yards, in November, 1894, obstructed travel for a month. When driving over the neighboring country on arriving, I observed that the trees of the district, small pines, had a general inclination toward the east, indicating prevailing west winds, and on inquiry learned that there was often a troublesome current in the canal caused by these winds, usually toward the east, the maximum being two and one-half miles an hour. Ship captains find that this current makes steering difficult. Some Greek steamers use the canal, but foreign companies have declined six months' free use as a trial, objecting to the narrowness of the channel, the currents, and the danger from land-slips. The banks seem very steep to one looking down on the canal from their tops, and when traversing the canal by steamer and looking upward I could readily see how this steepness intimidated ship captains. The French and German electric lights have been given up for the Edison, which are satisfactory, the dynamo engine coming from the General Electric Company, New York. The lights are 660 feet apart and exactly opposite each other, captains preferring this for steering. Traversing the canal from Isthmia at ten o'clock one evening in August, 1897, with Mr. Caratheodory, the director-general, in his private steamer, I saw the operation of the lighting system. We steamed quite rapidly, found a good light on the surface of the water, and kept the center line easily, going a short way out into the Posidonia harbor before returning to



CORINTH CANAL.

Isthmia. Soon afterwards, a Greek steamer of 300 tons, having an electric light in her cutwater, came into the Isthmia harbor, and, apparently without slackening speed, steamed on through the canal. The canal pays only operating expenses, the net earnings for 1897 having been only $3,700. The annual interest charges, which are $280,000, were added to capital account for 1895, 1896 and 1897. The president of the company is Etienne Streit, governor of the National Bank of Greece, and at present the Greek Minister of Finance, an able man of affairs. In explaining to me the operation of the canal, he advised against making the slopes in Nicaragua as steep as they had been made at Corinth, and said his own company would probably be obliged to reconstruct on better plans, not easily devised, before any considerable use of the canal could be made. The company should call in the aid of American engineers, improve the plans, and secure the considerable revenue which the canal could then readily earn.

SANITARY QUESTIONS.

Some objections have been offered to the views contained in the first edition of this volume as to the favorable climatic conditions in Nicaragua, which, in fairness, should now be mentioned. In discussing the subject with me, men of experience, conversant with the effects of excavation in Alabama and other Southern States, when extensive local construction was in progress, have insisted that it will be impossible to conduct canal construction in Central America without encountering a great deal of malarial fever. I give also the comments of Sir Leader Williams, made in London in July, 1897: "Your views about the health of the men when working in Nicaragua are too cheerful. Wherever earth has been made by decaying vegetation, and you turn that earth up to the sunlight, fever germs will escape, and you will have malaria. Those germs hold their life indefinitely, like the grains of wheat for centuries in the hands of the mummy in Egypt. I had fever among the men when digging the Manchester canal, and that was in the heart of England. Your engineers and your contractors must expect sickness in the construction camps in Nicaragua, and suitable allowance for it should be made in all the estimates and contracts."

I have found that the foreign engineers look almost as carefully to what our sanitary preparations are to be as they do at the plans themselves. Mr. F. J. Jacob, C. E., government executive engineer, Travancore District, South India, when speaking of the plans in general, says: "(1) Put all the camps on high ground; (2) clear the jungle well away *at the back* of the camps; (3) have the water supply carefully looked after, and (4) do not have work started too early in the day."

Dr. Johnston, the African explorer, now a practising physician in Brownstown, Jamaica, and a member of the legislative council, maintains that it will not do to say that the colored men, if employed at Nicaragua, will not be subject to fever. They will take it quite as truly as the whites. He cites the camps of De Lesseps and the cemetery at Monkey Hill, Panama, where fourteen thousand Jamaica men are buried, all fever cases. All it will do to say is that they are not as susceptible to fever as the whites. If taken to Nicaragua, he adds, the main point will be to give them good food.

One of the most successful American business enterprises in the West Indies is the Boston Fruit Company, dispatching an average of one steamer every day in the year, carrying the company's cargo only. The president, Captain L. D. Baker, who has lived twenty-seven years in Jamaica, told me that there were two points to be especially kept in mind if Jamaica laborers should go to Nicaragua: First, give them good food—"engines need coal," he puts it; and second, have accommodation for them as soon as attacked by sickness. Proper care the first day will cure them, with good shelter and good medical skill. He much approved of the care taken of the Jamaicans heretofore employed in Nicaragua, adding that the eighty men he had himself sent over to Chief Engineer Menocal all came back, and all returned in good health.

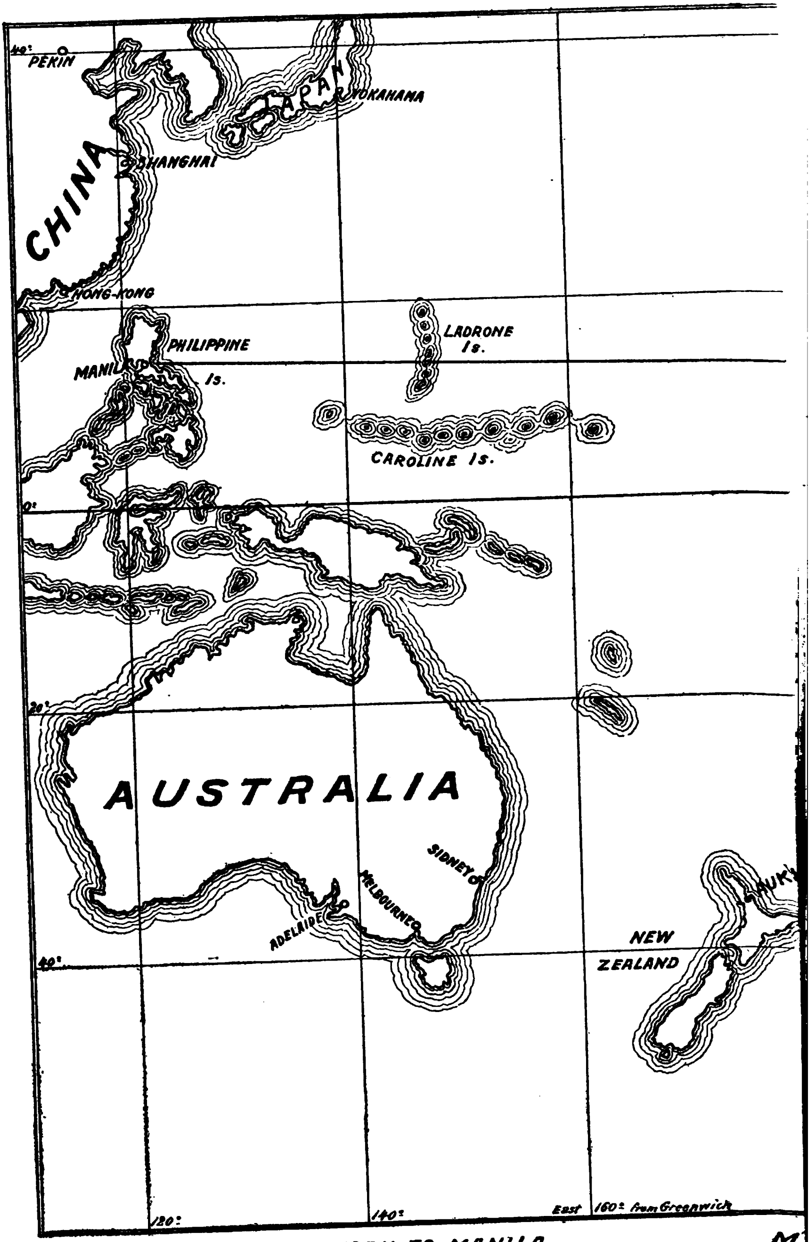
Our recent campaigns in Cuba and Puerto Rico have shown the American people as few other experiences could have done the great difference between conducting large undertakings in the tropics and at home. These campaigns were brief—only a few weeks—while the work in Nicaragua must require several years. It has come to be a matter of general knowledge that efficiency cannot be had without rigid and scientific attention to the health of the men. As a lesson of these campaigns, I urge again that the housing, food and medical care of the employees should not be in the hands of the contractors who will employ them. Far from home, uneducated and faithful, they will be working for the nation, and they should be the nation's wards. When construction has been begun and sickness has appeared, it will be too late to make fundamental changes. The legislation which orders the work to be undertaken should provide for the representatives of the government having the direct care of the employees.

In maintaining strict quarantine at ports, and sanitary regulations in camps, both imperatively necessary in Nicaragua as soon as construction shall be commenced, a military government will be best.

THE SITUATION TO-DAY.

We are now to have colonial possessions near the coast of Asia, and we must provide for better communication with them. From New York to Manila by way of Cape Horn is 17,000 miles. It will be reduced by the Nicaragua Canal to 10,600 miles. While we already have a route from New York to Manila by the Suez Canal, by which the distance is 11,200 miles, yet the passage through the heats of the Red Sea and the Indian Ocean is not the natural or desirable course for our commerce.

We are to have a new market for our productions in the Philippine Islands, which, even now, is not a small matter. It may become, however,



NEW YORK TO MANILA
VIA CAPE HORN 17000 MILES
VIA NICARAGUA CANAL 10600 "

the beginning of much greater things. China is at last to be opened to modern civilization. Its population is probably four hundred millions. Latin-America with its forty-nine millions, while still worth an earnest effort, is a minor attraction as a market compared with the great opportunities which China will afford. It is densely populated, without interior transportation, and the first necessity will be to furnish that transportation, a demand especially in line with the genius of our people. Not only will steam railroads be needed, but telegraph and telephone lines, and, to an enormous extent, electric railroads from town to town. After we have furnished transportation facilities as a beginning, a large and permanent trade in other things will naturally come to us. In competing with other nations, the Nicaragua Canal will be the deciding factor in affording us a shorter route and cheaper rates. It will make New York and Liverpool almost equally distant from Hongkong, instead of Liverpool being 5,000 miles nearer, as it is now. The great trade of China is rousing every energy of the chief nations of Europe, who know its value better than we do. It is a prize well worth a struggle.

Although Japan is becoming a manufacturing country, a valuable trade with her can be built up, especially in machinery for manufacturing. New York, by the canal, will be 2,400 miles nearer than Liverpool to Yokohama, an important advantage when prices are close, and the mills of New England and Pennsylvania will then find Japan a good customer. With Australia also a profitable trade can be built up. Melbourne will be by the canal 1,350 miles nearer to New York than to Liverpool. The day is coming, and is near, when our Pacific Coast States will grow out of their early conditions, developing from agricultural into manufacturing communities. When that day comes America will not merely share but will control the trade not only of China and Japan, but of every country which borders on the Pacific.

The necessity for having foreign markets in which to sell our manufactures, spoken of frequently in the preceding pages, has of late become much clearer than ever before. Organization among our manufacturers will be a great aid. A good example is the Spanish Club of St. Louis, now called the Latin-American Club. Leading manufacturers, merchants, bankers and railroad officials, to the number of two hundred and fifty, formed the organization. They selected a manager who had resided for twelve years in the City of Mexico, and had a large acquaintance in Latin-America. An interpreter is kept by the club at the principal railway station to meet all trains arriving from the south, and attend on travelers from Latin-America. Circulars are sent to all our consuls, from the Rio Grande to Cape Horn, explaining the plans of the club, and also asking advice, by letter or cablegram, of the departure of probable buyers for the United States. On the arrival of a Latin-American he is escorted to his hotel, where, if possible, pleasant quarters have already been engaged for him; he is taken to the Club and invited to make it his headquarters while in St. Louis, and messages are sent to the merchants and manufacturers who deal in the wares he wishes to buy. The latter call on him at once, invite him to their stores and factories, take him to drive, to dine and to the theater, and show him other social attentions; a carriage is placed at his disposal free of charge during all his stay in the city, and the stranger becomes not only a customer, but. a friend for life. Recently one such visitor purchased goods requiring twenty railroad cars to carry away, including mills, plows, tools and other articles needed for a colony on the Orinoco River. In a recent address the president of the club, who sells mill machinery, stated that in fifty years' business with Mexico he had never lost a single dollar by bad debts.

The events of only a few months past have wholly changed the point of view. With Cuba in our charge, and Puerto Rico, Hawaii, and part or all of the Philippines as possessions of the United States, there is no reason, if we are to furnish the money to construct the Nicaragua Canal, why we should not own that also. It will simplify the situation greatly. We should have the present concessions surrendered, repay the canal company all its actual cash outlays, and purchase from Nicaragua and Costa Rica a strip of territory from ocean to ocean sufficiently wide for the construction, operation and satisfactory control of the canal. Because of the present friendly feeling between the United States and Great Britain it is probable that the latter will now readily relinquish all claims to share in ownership or control. Neutralization of the canal will, probably, not be now seriously asked by any power. That question was practically disposed of in the Venezuela Boundary incident. Secretary Olney then laid down the doctrine—the latest declaration of policy by this country—that in the Western Hemisphere the United States is the paramount power. That position has been generally acquiesced in. No nation of Europe has territory so near to the canal, or any large colonial possessions which can be so quickly reached only by that waterway, as to justify a demand of neutralization. Absolute ownership of the canal is a matter of the greatest national importance to us, from both a commercial and a military point of view. In all our dealings with other nations hereafter the Nicaragua Canal will always be accounted by them one of our important resources.

The construction of the canal will be a much larger affair than any of our ordinary river or harbor works, and it will be better for Congress, in framing its legislation, to provide for a special commission having power to govern the new canal territory through a military government during the period of construction; to select the route, decide on the plans, let the contracts, prepare and enforce all quarantine and sanitary regulations, and take entire charge of the whole undertaking. To provide means for the cost, an issue of bonds can be made, if deemed necessary; but as the work will extend over several years, it is probable that the outlays can be met by annual appropriations from the ordinary revenues of the country.

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